185 Vol. XLIX

JUNE 6th, 1946

FLIGHT

and AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

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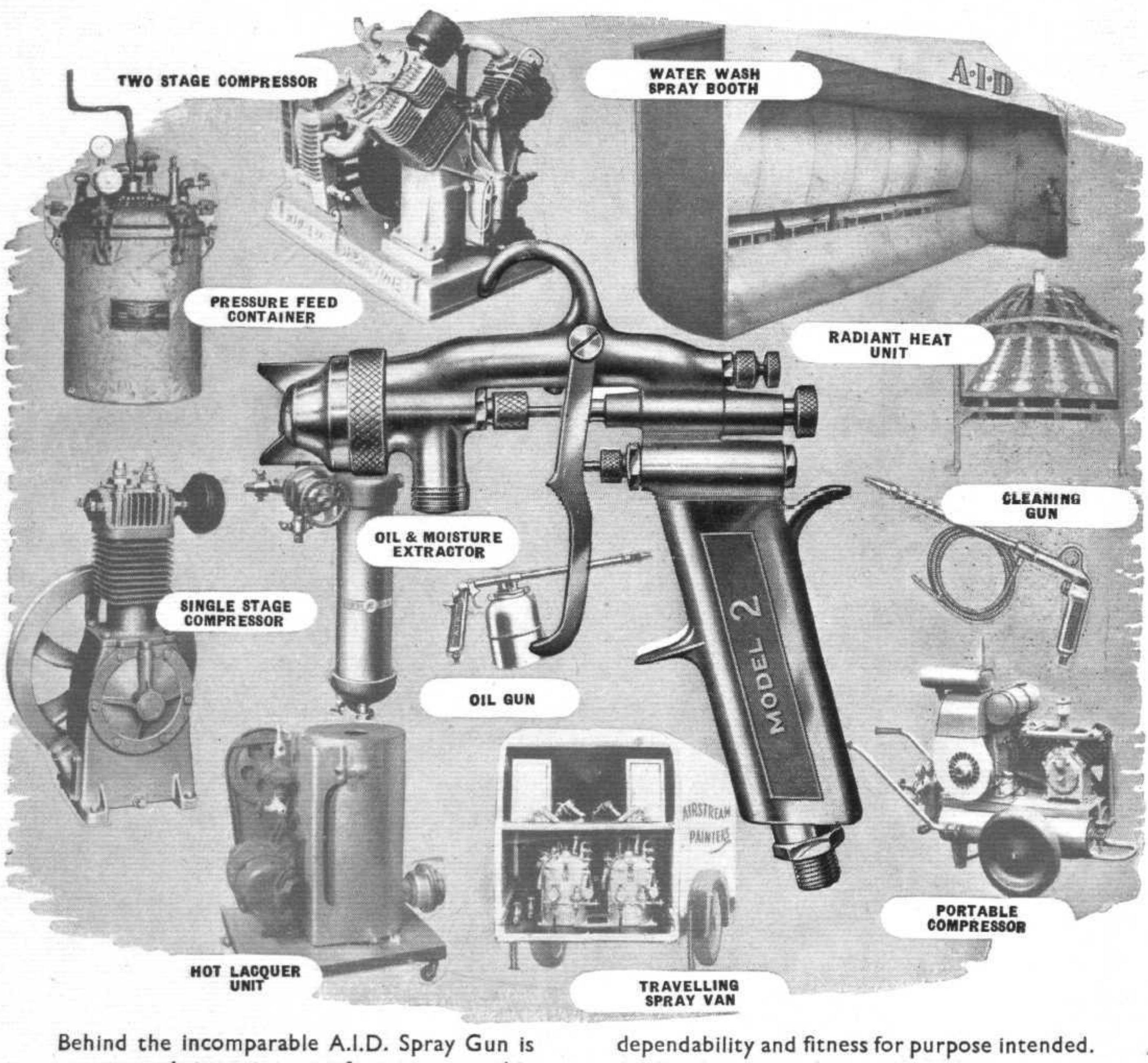

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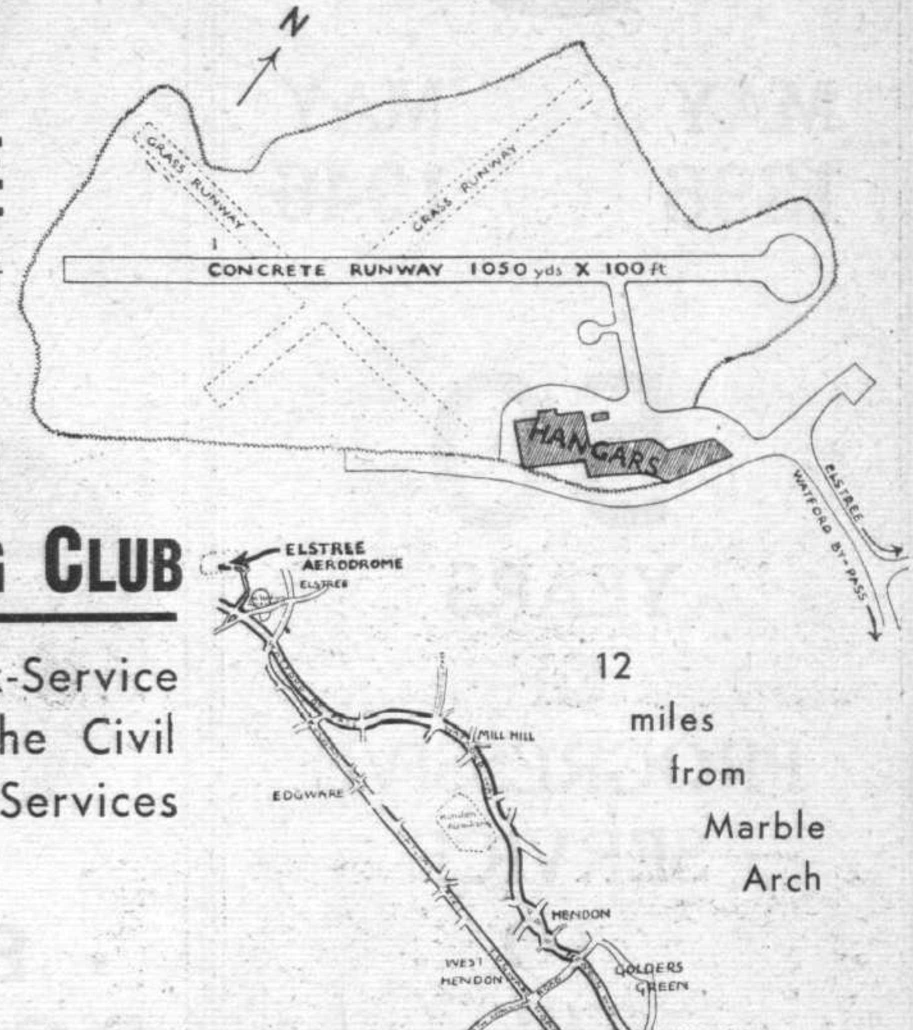

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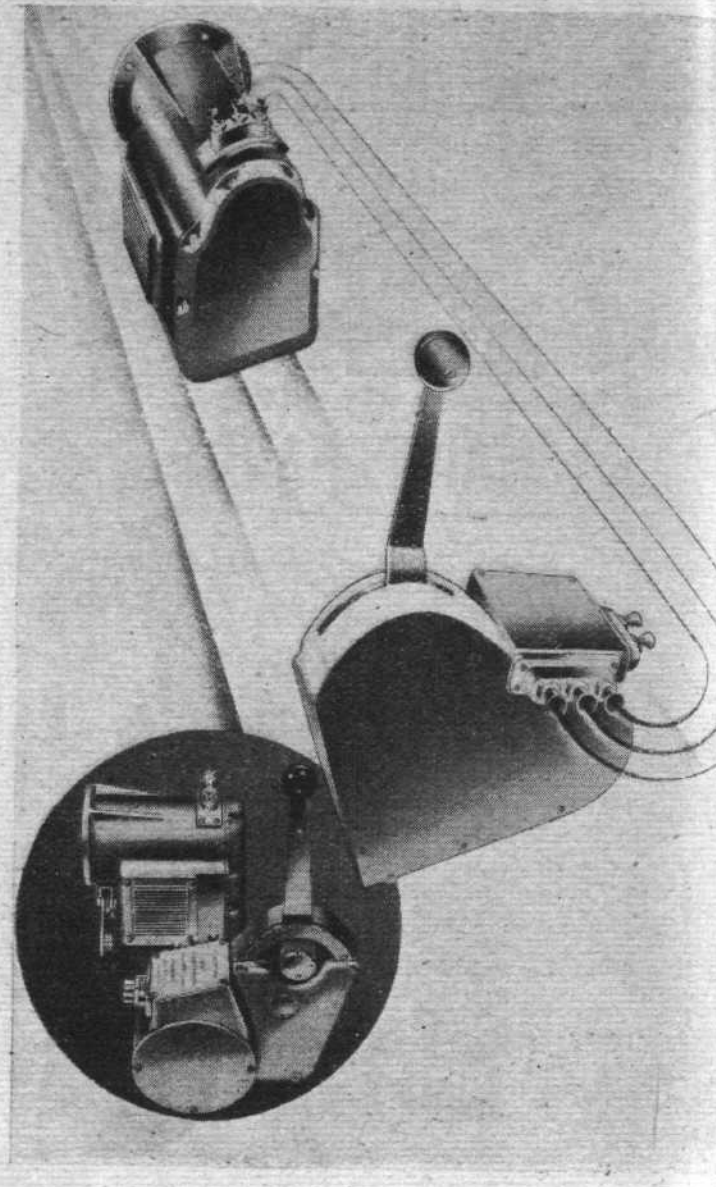

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The Outlook

Wings of the Future

AMONG the 33 Wilbur Wright Lectures which preceded this year's we have had many admirable subjects and treatments, but probably none which gave such a fascinating glimpse of future possibilities as that delivered to the Royal Aeronautical Society last week by Mr. E. R. Relf, principal of the new College of Aeronautics. During the war, fundamental research was reduced but did not cease entirely, and although some of the new ideas which emerged from such work as was done are still of a secret nature, Mr. Relf was able to disclose enough to whet one's appetite for more. Not only so, but if but a portion of what seems possible can be achieved, we are indeed at the opening of a new and revolutionary stage in the history of flying.

The lecture logically divided itself into two parts, the first dealing with laminar-flow wings and boundary-layer control and the second with flight at transonic and supersonic speeds. The first half is reported in this issue, the second half will be published next week. Both subjects bristle with difficulties and unknown quantities, but the prizes which await the winning are so glittering that almost any effort appears worth making to overcome the obstacles in the way.

It had been stated previously that so-called laminar-flow wings offered a great reduction in drag, but it had been found that very minute irregularities (dust and flies) in the surface were sufficient to spoil the effect. Mr. Relf offered the solution of thin sheets which could be stripped off once the aircraft had reached a height where the air was clean. But the difficulty of ordinary manufacturing limits still remains. To preserve the contour with the accuracy demanded it may be necessary to use very heavy gauge plating and grind it to size. Apart from this, however, there is the question of breaks in the contours caused by such items as nacelles in the case of multi-engined aircraft, and the effect of airscrew slipstreams. Jet units may in time be small enough to be wholly submerged in wing or fuselage but the location and shaping of air intakes and associated ducts will demand the closest attention.

Boundary-layer Control

EVEN more surprising promises are held out by control of the boundary layer. The basic idea is old, but only recent work has indicated ways and means which *appear* capable of practical application. One form is the so-called suction aerofoil in which the boundary layer is pumped away near the trailing edge, thereby maintaining laminar flow up to the suction slot. Although complete laminar flow right up to the trailing edge appears unattainable, great advantages seem to be possible of achievement, not the least of which is that it appears feasible to use very thick aerofoil sections (40 or even 50 per cent of the wing chord) without incurring a greater drag than that customary in orthodox wings. The advantages of this in structure weight, stowage space and so forth are obvious, but these thick sections appear to have a fairly low critical Mach number, so that they are likely to be useful at moderate speeds only.

These are some of the goals which appear to be attainable. Just how the details will shape themselves is still uncertain. A vast amount of research and experiment will have to be carried out, both by Government institutions and by private enterprise, but certainly few if any of the problems appear incapable of solution.

Boundary-layer suction promises to have its uses in thin high-speed sections also, but mainly in the way of giving increased maximum lift coefficients. Thin wings are deficient in lift, but a suction slot near the leading edge might, Mr. Relf believes, raise the value to something like 2. This would obviously be of very great use for supersonic aircraft, so here, too, suction appears to have an important contribution to make.

An Excellent Move

THE disclosure that agreements have been concluded between the British and French Governments for the supply of English aircraft material to France will be wholeheartedly welcomed in both countries. During the German occupation, French designing was reduced almost to vanishing point, the firms being compelled, in the main, to build German types. The French aircraft industry is slowly struggling to its feet, but it must of necessity take a considerable time to reach really useful output. What more natural and logical than that France should draw upon our experience, an experience won in the hardest school

There is little doubt that the French people themselves will applaud the decision. During the war they saw at first hand the excellence of our equipment in action, and they formed a very high opinion of the skill of the Royal Air Force. In air engagements between the R.A.F. and the *Luftwaffe* there was no doubt who was the master, and when the dire necessities of the war compelled us to bomb French targets, the acuracy was such as to cause a minimum of destruction of property on the perimeter of the target area.

What the reaction of the rest of the world will be remains to be seen. We can think of some countries which are not likely to welcome the Franco-British agreements with enthusiasm.

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Jets and Turbines

UNCERTAINTY about the composition and equipment of the Royal Air Force of the future has had a bad effect on potential personnel. The disclosure by Mr. Wilmot and others that this country will concentrate on jets and turbine-driven airscrews will not have done very much to clear the air for those who are contemplating a career in the R.A.F., but in other respects the announcement must be applauded.

Great Britain has been fortunate enough to establish a good lead with these types of power plant, and it is logical that she should exploit that advantage to the full. The future undoubtedly lies with jets and turbines, but it is necessary to utter a word of warning against undue optimism. The plain jet is a simple affair and the main problem is one of airframe design.

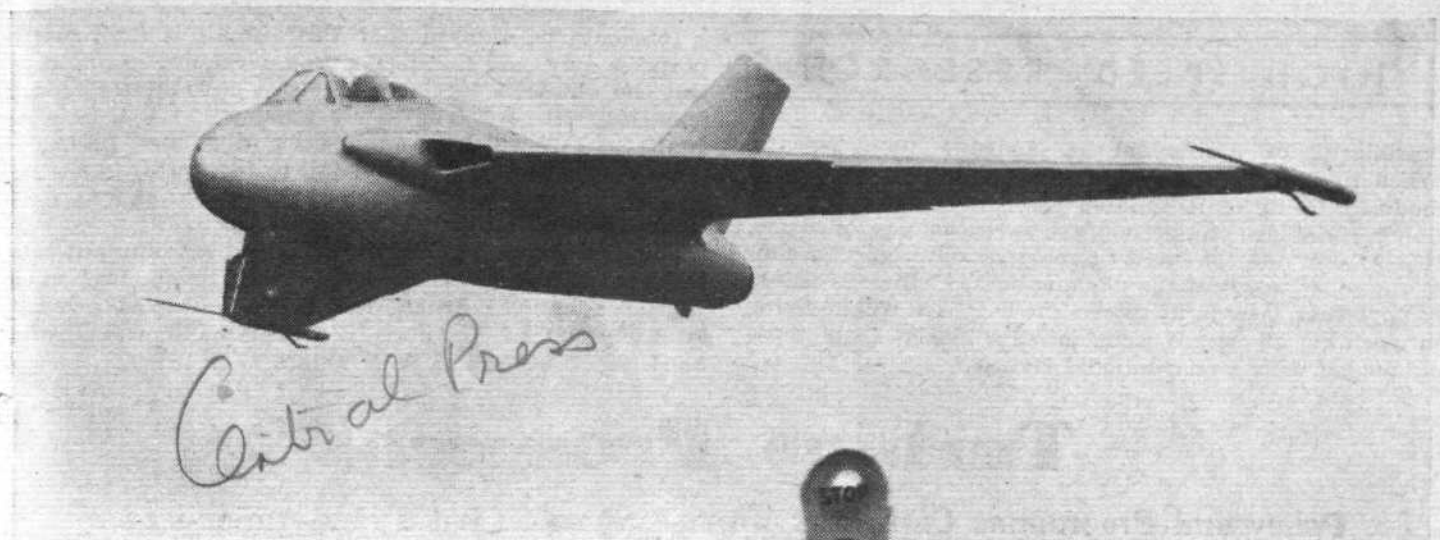
In the turbine-driven airscrew class, however, much development work must be done before practical and proved combinations can come into extensive use. The main difficulty is that the turbine is almost a single-speed machine so that special gearing will be essential if both turbine and airscrew are to give good efficiency over a range of operating conditions.

The Auxiliary Air Force

THERE is a good deal of cause for satisfaction with the official announcement concerning the re-forming of the Auxiliary Air Force. The preponderance of day-fighter squadrons is logical, and the fact that all squadrons are to be equipped with operational aircraft types is merited by the part played by A.A. squadrons during the war. It is particularly gratifying to learn that some of the officers who served in the war are to be given a chance to command their old squadrons. Many distinguished themselves in various ways, and their appointment to commands will be much appreciated by the re-formed squadrons.

Central Press

EXPLORATORY : The de Havilland 108 high-speed research aircraft, built solely for the investigation of control and stability problems associated with swept-back wings. The fuselage is that of a Vampire, but the wing, with its slots and "elevons," embodies design features which may eventually be reproduced in the D.H. 106, or Brabazon IV, transport. The D.H. 108 has been flying since May 15th at Woodbridge and Hatfield.



HIGH-SPEED RESEARCH

The de Havilland 108 Announced : Experimental Basis for Later Types

That there is little wrong with the stability and control characteristics of the D.H. 108 is obvious from the way in which it is being flown here past the end of the experimental shop at Hatfield.

FOR some months the fact that de Havillands were at work on the development of a special high-speed research aircraft has been a well-kept secret amongst those more or less immediately interested. During its initial tests—which were made from Woodbridge, near Martlesham, Suffolk—some vague statements had been made about a "mystery aircraft" which had been seen in those parts, but, apart from that, no mention had been made of it.

However, Mr. Arthur Woodburn, the Parliamentary Secretary of the Ministry of Supply, let the secret out last week when he visited Hatfield to pay his official respects to the D.H. Dove. Actually, the D.H. 108, as the new aircraft is designated, had been flying since May 15 from the long runway at Woodbridge and had then only just been brought back to Hatfield for continued trials. Apart from the obvious need for adequate space in which to make initial "straights" with any such unconventional aircraft, Woodbridge was also chosen on the score of necessary secrecy and because Hatfield, where runway construction is in progress, was in a sufficiently difficult condition even for test work with normal aircraft. Woodbridge, it may be remembered, was laid out during the war as a special emergency landing area for use by returning bombers which were in a generally poor state of serviceability. The main runway is 3,000 yards long and 250 yards wide, with grass undershoots and overshoots of 500 and 1,000 yards respectively.

Full-scale Research

The D.H. 108 has been designed and built solely for the purpose of exploring control and stability problems in aircraft with swept-back wings. It is not, in any sense of the word, a "flying wing," but has a fuselage which is, in fact, that of a standard Vampire. The idea of using such a standard fuselage, powered by a D.H. Goblin jet-turbine, was the result of the need to get the 108 into the air as quickly as was reasonably possible. The work on the project was only started in October.

During the past three weeks' flying no modifications have been found necessary, in spite of the fact that both the layout and the control systems were unusual. The 108 has no tailplane or elevator and the ailerons perform the function, also, of elevators, becoming "elevons" according to normal tailless tradition. It has, however, a fin and rudder of high aspect ratio and a considerable sweep-back, while, in its provisional research form, there are fixed slots covering half the wing-span inwards from the tips. The intakes are generally similar to those of the Vampire, but appear to be of smaller throat area and are well outboard of the wing root. At the wing tips there are faired protuberances which carry emergency-control parachutes.

So far, and during the coming weeks, a good deal of research flying will be done to explore the problems and

Initial tests of the D.H. 108 were carried out by Mr. Geoffrey de Havilland, who is entering the cockpit. The intake position and "boundary-layer breaker" are interesting, though these may, of course, be quite temporary and modified later for high-speed research.

HIGH-SPEED RESEARCH

possibilities of the layout at moderate flying speeds. When this research has been completed, the 108 will be modified to make it suitable for really high-speed test flying. The idea of a pronounced sweep-back is, of course, that of delaying the onset of compressibility effects, and, in the sober words of the manufacturers, "there is reason to hope that, later in its career, the D.H. 108 will be flying successfully at speeds substantially higher than those obtainable with a conventional layout."

It should be stressed that this aircraft is for research purposes only, and that it has been developed so that data may be obtained for later application to both military and civil aircraft. The newly announced D.H. 106—or Brabazon IV—will have swept-back wings and, probably, pure jet propulsion, but its detail features will, to a great extent, be based on the results of the present experimental work with the 108.

Since little experience has previously been obtained with tailless types—and none with prospectively high-speed versions—the development test flying, which has, so far, been done by Mr. Geoffrey R. de Havilland, will be of a most important and difficult nature.

Turbine Prospects

Policy and Programme Clarified : Three "Secret" Civil Types Announced : Completing the Brabazon List

AT a recent Ministry of Supply conference, to announce the Government's plans in the matter of gas turbines and, in particular, of their application to civil air transport, three announcements of outstanding interest were made. These were: (1) That all large airliners to succeed the present interim types will be powered by pure jet or airscrew-turbine units; (2) that the R.A.F. will in future be interested only in fighters and bombers with gas turbines; and (3) that the Mond Nickel Company have succeeded in producing a much-improved alloy for turbine blades. In addition, the first public mention of the Brabazon IIB, III and IV was also made, and preliminary details of these and other types were announced.

The impression given at the conference by Mr. John Wilmot was that, because of our complete concentration on war production until about nine months ago, we are, at the present time, unavoidably outclassed in the commercial aircraft field by America; that we must expect this condition to persist to some extent during the period in which interim designs are in use; but that, looking some five or six years ahead, we have good reason to believe that British aircraft then beginning to come off the stocks will be at least as good as, and probably better than, any others. It was perhaps insufficiently stressed that this country has, at present, complete supremacy over all others in the matter of gas turbines—the type of power unit on which all large designs of the future are to depend.

It has already been suggested that before gas turbines are generally applied to passenger aircraft they should be given a period of flight development on large experimental and freight aircraft. It is therefore interesting to learn that, for purposes of engine development, two Rolls-Royce Nenes are being installed in place of the outboard Merlins of a Lancaster. In addition, trial installations of turbines are to be made in at least one example of many of the interim airline types, such as the Marathon, Viking and, possibly, the Dove. In connection with the last two aircraft, the existence of a new, small Armstrong-Siddeley turbine, the Mamba, has been unofficially mentioned. It may well be that the virtual absence of vibration and reduced noise which are characteristics of the gas turbine, and the avoidance of the use of what have been called "whirling lumps," will be rated among the most important advantages of this type of power unit from the point of view of both airline passengers and airframe designers.

One cannot help feeling, however, that in view of the vigour and enterprise of American manufacturers and of their full-length start, the attitude of the authorities towards aircraft designs for the immediate future is over-complacent. We are, in effect, pinning all our hopes on a few aircraft which are as yet quite untried and which, in several cases, will depend upon airscrew-turbines at present in a very early stage of development.

While British and German military aircraft operated during the war with pure jet units, and many examples now fly daily, there is no military or other source from which we can draw data on the far more complicated turbine-airscrew units. The experimental Rolls-Royce Trent (two examples of which were installed in a Gloster Meteor) is the only airscrew-turbine combination so far to fly in this country, and the principal designs of this type, namely the Bristol Theseus, Rolls-Royce Clyde and Armstrong-Siddeley Python, are still battling with teething troubles, not the least of which is the problem of airscrew reduction gear design.

A Chance for Collaboration

Certainly if we are in a weak position with regard to airframes, the U.S.A. must be equally concerned about gas turbines. The true value of jet propulsion for airline work will only become apparent when aircraft designed specifically for such units can be operated. It is true, however, that some such designs are reaching an advanced stage in America, and that certain others, already flying with very large piston engines, are of sufficiently advanced design to be suitable for adaptation as interim turbine-powered machines. The position may be reached where American airframes will be fitted with British turbines, and where "face" must be lost on both sides in order to meet international airline requirements—in much the same way as immediate military needs were of necessity fulfilled in wartime.

At the conference, Air Marshal Sir Alec Coryton, Controller of Aircraft Supplies to the M.o.S. and member of the Air Council, said, in as many words, "*only* jet propulsion for military aircraft," and Mr. John Wilmot, Minister of Supply, said, "*only* gas turbine for new airliners." If any confirmation is needed that large piston engines will very soon be a thing of the past, it would be hard to find it stated more definitely or with better authority.

In any case, the information given at the conference has at last made it possible to complete the "Brabazon list" of future civil types. There had previously in this list been two or more gaps which could only be filled in print at the risk of ex-communication by the Ministry of Supply—or even by the Special Branch of the C.I.D.

At least until any further subsidiary types are added, this list, given by Brabazon type numbers, is as follows:—

I. The Bristol 167, the second prototype and the first production version of which will have airscrew-turbines.

IIa. The Airspeed AS-57 Ambassador which, though initially powered with piston engines, has also been designed to take airscrew-turbines.

IIb. The Vickers VC-2, an airscrew-turbine powered replacement of the Viking.

III. An un-named Avro replacement for the Tudor II—a 90,000 lb transport powered with four turbines.

IV. The de Havilland 106, a pure jet tailless transport of about 75,000 lb for long-range services at very high cruising speed—probably of the order of 500 m.p.h.

Va. The Miles Marathon.

Vb. The de Havilland Dove.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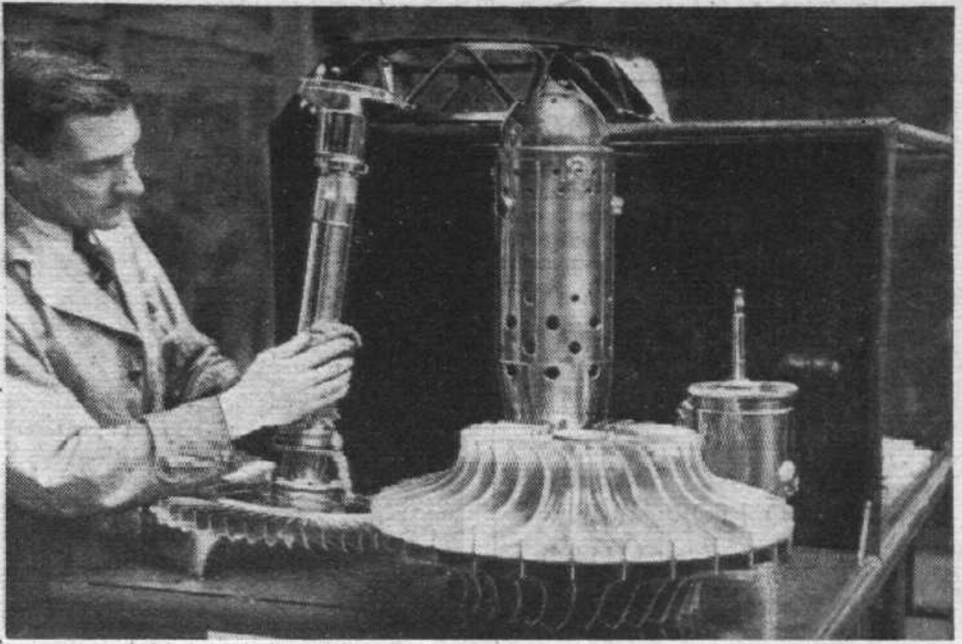


A SHINING EXAMPLE: Polishing a sectional model of the Rolls-Royce Derwent jet-propulsion engine for exhibition purposes. The usual high standard of "finish" of such R.-R. models needs no stressing.

"Flight" photograph.

V-Day Ban

FROM noon until 2 p.m. on Saturday, June 8th, no civil aircraft may fly within the London control zone or that part of the South-east flight safety region which lies above the U.K., at a lower height than 3,000ft except when taking off or landing at an airfield.

The London control zone covers a radius of 24 miles from Westminster Bridge but during the 24 hours ending at midnight, June 8th, no civil aircraft may fly above the area within seven miles radius of Westminster Bridge. The "flight safety region" is a funnel approach to the control zone.

A.A.F. to Re-form

LAST Sunday's "release" via the B.B.C. about the re-forming of the Auxiliary Air Force was anticipated at the reunion dinner of No. 604 (County of Middlesex) Fighter Squadron in London the previous evening when Group Capt. J. Cunningham, who was the squadron's C.O. in 1941 and will again command it, told the 200-plus "Old Comrades" present that it was to be one of the 13 day fighter squadrons equipped with Spitfires (cries of "Shame" "Let's have seats" from ex-navigators and air-gunners).

Plans as now announced also provide for three night-fighter and four light-bomber squadrons equipped with Mosquitoes, making 20 squadrons in all.

Rival Flying Mothers

OUR paragraph in last week's "News in Brief" about the claim of the Wiltshire School of Flying to have trained the first post-war woman to fly solo was really intended to read "first post-war *mother* to fly solo," the lady in question being Mrs. Nancy Taylor-Young who has two children.

On March 21st we had already announced that Mrs. R. Morrow-Tait was the first post-war woman pupil pilot to fly solo and had completed her "A" licence tests at Marshall's Flying School, Cambridge, the week before.

But it now appears that even the substitution of "mother" for "woman" would not have made the Wiltshire school's claim entirely valid, for Mrs. Morrow-Tait telephoned to say that, while heartily congratulating her sister-pilot on her performance, she herself can go even one better because she *took her baby with her* on her solo flight. In fact, she adds, its arrival is not due just yet!

As mere males, we retire in bewildered admiration!

British Aircraft for France

UNDER the Anglo-French air agreement announced last week-end, Britain is to supply the French Air Forces with 1,451 aircraft; the French 2nd Air Group at Friedrichshafen and a fighter group in Indo-China are already equipped with Spitfires.

Types to be delivered include Mosquito, Halifax VI, Sunderland III, Seafires, Spitfire IX, "met." Hurricanes, Wellingtons for reconnaissance and training, and Ansons. In addition we are delivering 6,000,000 gal of high-octane petrol, 100,000 bombs, 11 radar stations, three Naval Air Arm stations, a repair depot and an air-sea rescue unit.

Cold Courage Indeed

BY the time these words appear "on the street," the Martin-Baker experiment with a Gloster Meteor fitted with pilot-ejector gear will probably have been carried out.

All we can do at the moment of writing is to record the cool pluck of Bernard Lynch (yes, he's Irish and a former member of the Eire Air Force) who has already made more than 200 tests with an experimental rig, and volunteered to try out the device from a specially adapted two-seater Meteor at high speed.

Some German fighter types in the 500 m.p.h. plus category had similar equipment for bailing out at very high speeds, and the Martin-Baker concern has been developing its version since September, 1944.

Submarine Flat-tops

AIR VICE-MARSHAL SIR KEITH PARK, who is in New Zealand for air talks on the standardization of technique, equipment and training throughout the Empire, said in Wellington last week that he believed the submersible aircraft-carrier to be the Navy's answer to atomic long-distance missiles.

"People will probably have a fit at the suggestion," he added, "but somebody had better start experimenting and carrying out tests with models."

Still Swift

AIR VICE-MARSHAL JOHN N. BOOTHMAN, Assistant Chief of Air Staff (Technical Requirements) at the Air Ministry, recently flew a P.R. Spitfire from Hendon to Rabat David, near Haifa, Palestine, a distance of 2,750 miles, in 12 hours 25 minutes. He went via Istres (near Marseilles), Castel Benito (near Tripoli) and El Adem (Libya), and is visiting the R.A.F. Staff College at Haifa.

Flying Boats at Greenwich

TWO Sunderland flying boats of R.A.F. Coastal Command, outlined with coloured lights, are to be moored on the Thames at Greenwich opposite the Royal Naval College for the Victory celebrations, and will remain there for seven days from June 4th.

The public are to be invited to visit the Sunderlands and also three air-sea rescue launches moored close by from mid-day until one hour before sunset on June 9th, and from 10 a.m. until one hour before sunset on June 10th.

Any Offers?

ANYONE with a pressing desire to get to Australia quickly and about £300 to spend will be interested in an advertisement which appears in the "classified smalls" in this issue.

It has been inserted by Flt. Lt. D. N. Dalton, who served three years with the R.A.F. in Australia during the war, and since his return to England has bought a Proctor in which he is flying back to Melbourne in September to set up in the air charter business "down under."

The trip will be made in short hops, sight-seeing on the way, and he wants two passengers to share in the expenses.

Any Challengers?

THE Whiteman family, of U.S.A., must be one of the most air-minded families in that land of air-mindedness, for it is reported that 13 year old Marvin Whiteman, Jr., has just completed 60 hr. at the controls of his father's Ryan ST and could solo with the best if the C.A.A. would let him. He was eight when he had his first flying lesson. Now papa Whiteman is busy teaching Mar-

HERE AND THERE

vin's 11-year-old sister, Lynn Carol, to fly, too.

Which raises the question—is this a record for youthful pilots? We seem to remember that Louis Bleriot not only taught his schoolboy son to fly, but actually built him a small made-to-measure single-seater monoplane which Master Bleriot flew when he was ten.

Our correspondence columns are wide open to proud flying fathers with superior claims.

DISTINGUISHED VISITOR: Marshal of the R.A.F. the Viscount Tedder, G.C.B., recently paid a visit to the Napier aircraft engine works at Acton. On his left are Sir George Nelson, the firm's chairman (nearer camera) and Mr. H. G. Nelson, managing director.

News in Brief

PRINCESS ELIZABETH, broadcasting to the youth of the Empire from the Albert Hall last week, suggested the interchange of visits by air among schoolchildren and members of youth organizations, in order to preserve wartime friendships.

* * *

Sir Miles Thomas, vice-chairman of the Nuffield organization, recently strongly advocated increased supplies of newsprint and paper for export catalogues, when addressing Glasgow Publicity Club.

* * *

Mr. A. D. Duncan, of the aviation division of R. K. Dundas, Ltd., has recently returned from his tour of South America which he undertook to develop the firm's exports in Argentina, Uruguay, Chile and Brazil.

* * *

The Royal Society of Arts is offering two £50 prizes for 1946 under the Thomas Gray Memorial Trust. The first is for an invention in the science or practice of navigation and is open to anyone of British or Allied nationality, and the second for a deed of outstanding professional merit by a member of the British Merchant Navy.

* * *

Seven L-type airships have been purchased from the U.S. Government by the Goodyear company for experimental purposes. Built by the company during the war, these airships were used for training pilots for duty on the larger K and M types used by the U.S. Navy for coastal patrol work, and the firm now proposes to establish transatlantic travel by full-sized rigid airships.

* * *

Envelopes bearing pictures of Peter Stuyvesant, the Dutch-born Governor of New Amsterdam (New York) in 1647, were issued for letters carried on the first K.L.M. Amsterdam-New York flight on May 21st. They bore the words, "I never dreamed of this," and the postmark combined drawings of the steeple of an Amsterdam church and the Statue of Liberty.

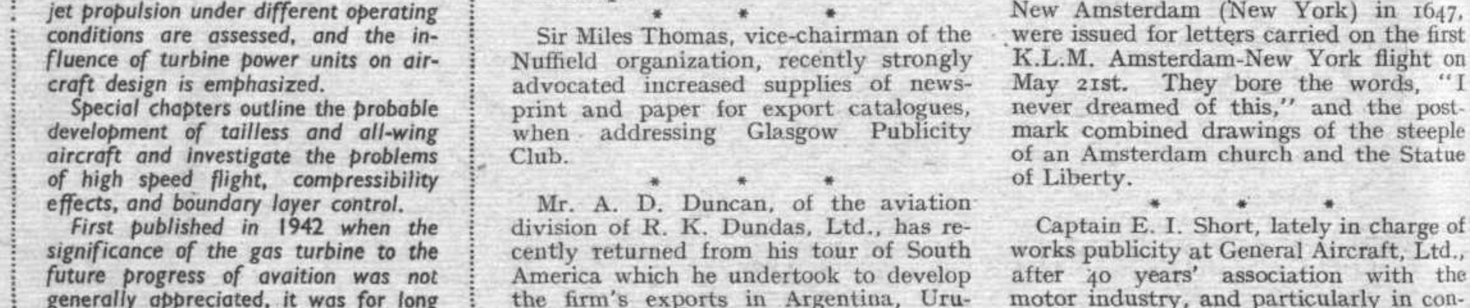
* * *

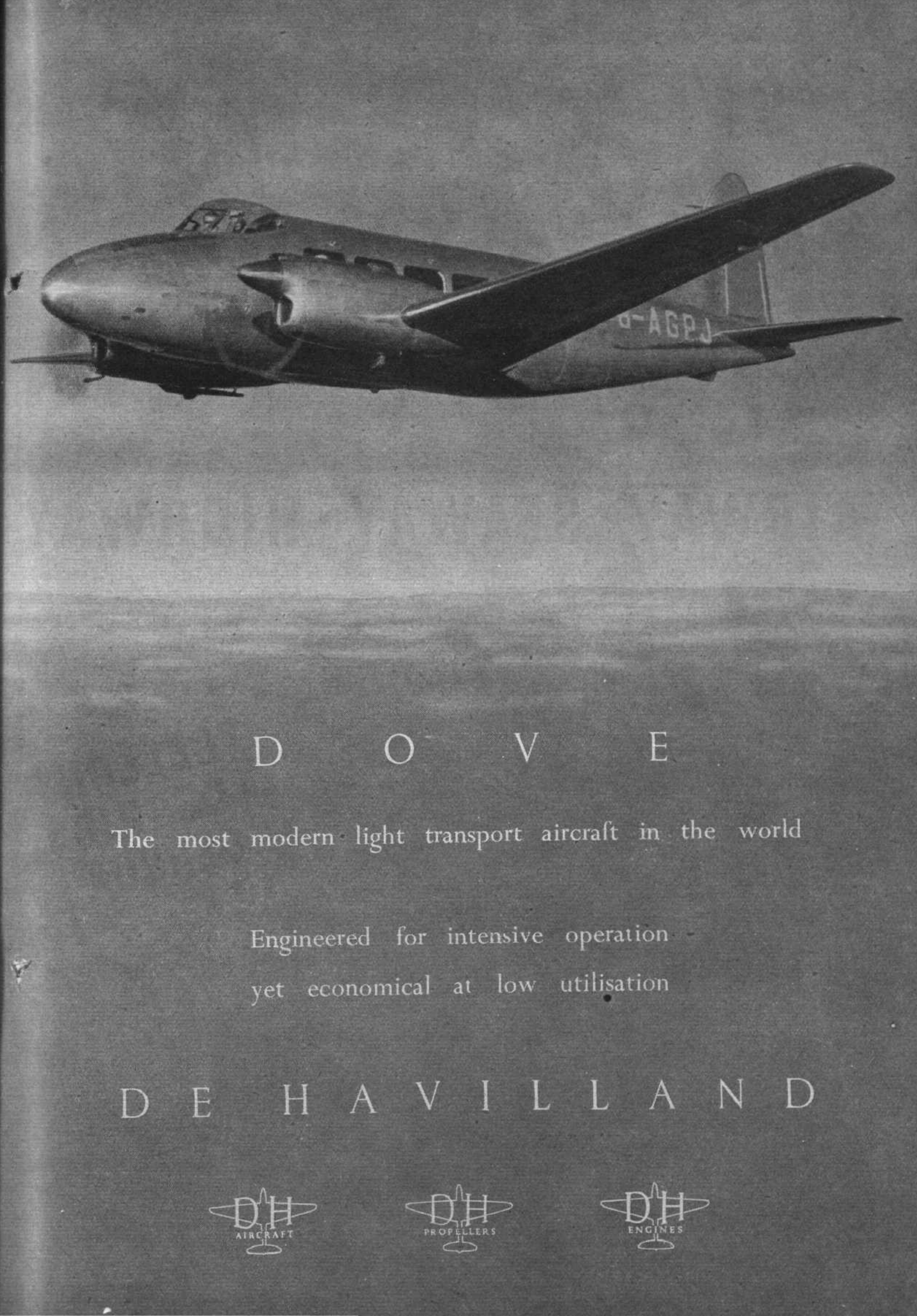
Captain E. I. Short, lately in charge of works publicity at General Aircraft, Ltd., after 40 years' association with the motor industry, and particularly in connection with air rallies and *concours d'elegance*, has been forced to retire from business. He is in Ashford County Hospital and will be pleased to hear from any of his friends.

* * *

Mr. E. S. Thomson, of the aviation division of the General Electric Company, said recently that he hoped that the TG-100 gas turbines would have passed all requirements and would be ready for use on passenger transports by 1950. He recommended that the airlines experiment with power plants on cargo flights before introducing them for passenger use. The success of the axial-flow TG-180 in the Republic XP-84 had considerably cheered their engineers.

AIRSTRIP . . . . No. 17




DOVE
The most modern light transport aircraft in the world
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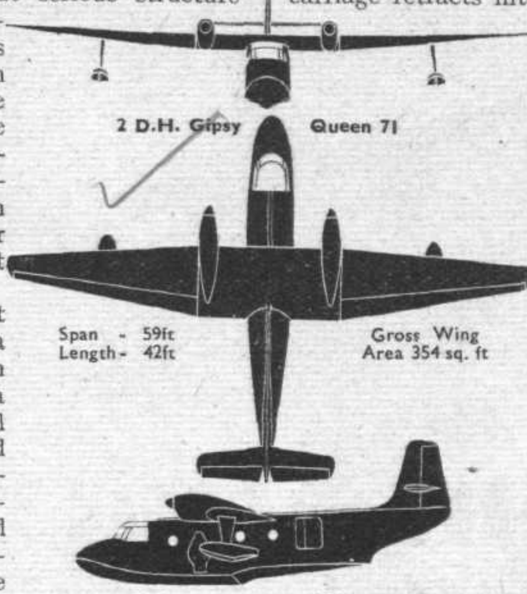
British Amphibian

Short Brothers' Twin-engined Five-passenger Boat for Charter and Feeder-line Work : Details of the Sealand

FLIGHT has many times regretted the fact that, for many years, no British manufacturer has found time or good reason to design and construct a practical amphibian. We all know that serious structure-weight and other difficulties are involved in any such layout and, unless very robustly made, an amphibian type may be neither a good landplane nor a good flying boat. But we have always felt that amphibian development was worth serious attention—and particularly by manufacturers in this country who have had a greater experience than any other of boat development.

The fact that this country's first modern amphibian is being built by a firm which has always specialized in sea-going aircraft should provide a reasonably good assurance that it will be practical. Short Brothers intend their new amphibian to be, in addition, capable of large-scale production, and have therefore concentrated on designing for simplicity of manufacture and maintenance ease. Since it is a twin-engined aircraft intended for commercial operation, it has been necessary also to plan the aircraft for single-engined airworthiness in the A.R.B. sense.

The necessity for providing airscrew clearance in any such project means that an amphibian must follow "conventional" flying-boat lines, and the Short boat has a cantilever wing mounted high above the hull and with the engines "overslung" rather than underslung. The undercarriage retracts into the hull at the point just ahead of the leading edge, and will have a track of ten feet. The hull had necessarily to be a compromise in size and shape, to provide good sea characteristics, good airflow lines and useful capacity. The accommodation is for a pilot and five passengers, but there will be two emergency seats.



The engines are D.H. Gipsy Queen 71s with feathering and reversing airscrews. Reversibility may, particularly in the case of a small flying boat, be of considerable value for general handling in the confined waters which might often be used. With these engines, the estimated maximum cruising speed is 168 knots, while a range of 540 nautical miles is expected when carrying five passengers and baggage weighing a total of 1,000 lb. The all-up weight of the amphibian will be 8,500 lb.

The undercarriage is to be half-recessed when retracted, and the tailwheel moves up to a position behind the rear step, where it can perform the functions of a water rudder. This, in conjunction with engine control, should make it easily "handleable" in a tideway.

Reading Garden Party

CONGRATULATIONS are due to the Reading and District Branch of the Royal Aeronautical Society for organizing a very pleasant and successful little garden party on Saturday, June 1st.

The large number of visitors to Woodley airfield, which was lent for the occasion by the O.C. No. 16 E.F.T.S., and by Miles Aircraft, Ltd., were able to see a very interesting display of flying by a large variety of light- and medium-sized aircraft. For a start there was a fly-past of all available Miles types including Marathon, Monitor, Aerovan, Gemini, Messenger, Libellula, and older types such as Magister and Sparrow Hawk. This was followed by a demonstration of aerobatics by Mr. Ken Waller, Miles' chief test pilot, which was particularly praiseworthy for his assessment and use to the limit of the Sparrow Hawk's power and speed.

With the help of a strong wind with rather bumpy air the climb following take-off and the slow flying of some of the aircraft was startling. Mr. George Miles gave a polished and convincing demonstration of the manœuvrability and control at very low speeds of the Messenger and both this and the Aerovan, particularly when climbing, seemed on occasions to be trying to make up for the absence of the helicopter demonstration which, together with a Vampire shoot-up were two items unfortunately deleted from the programme.

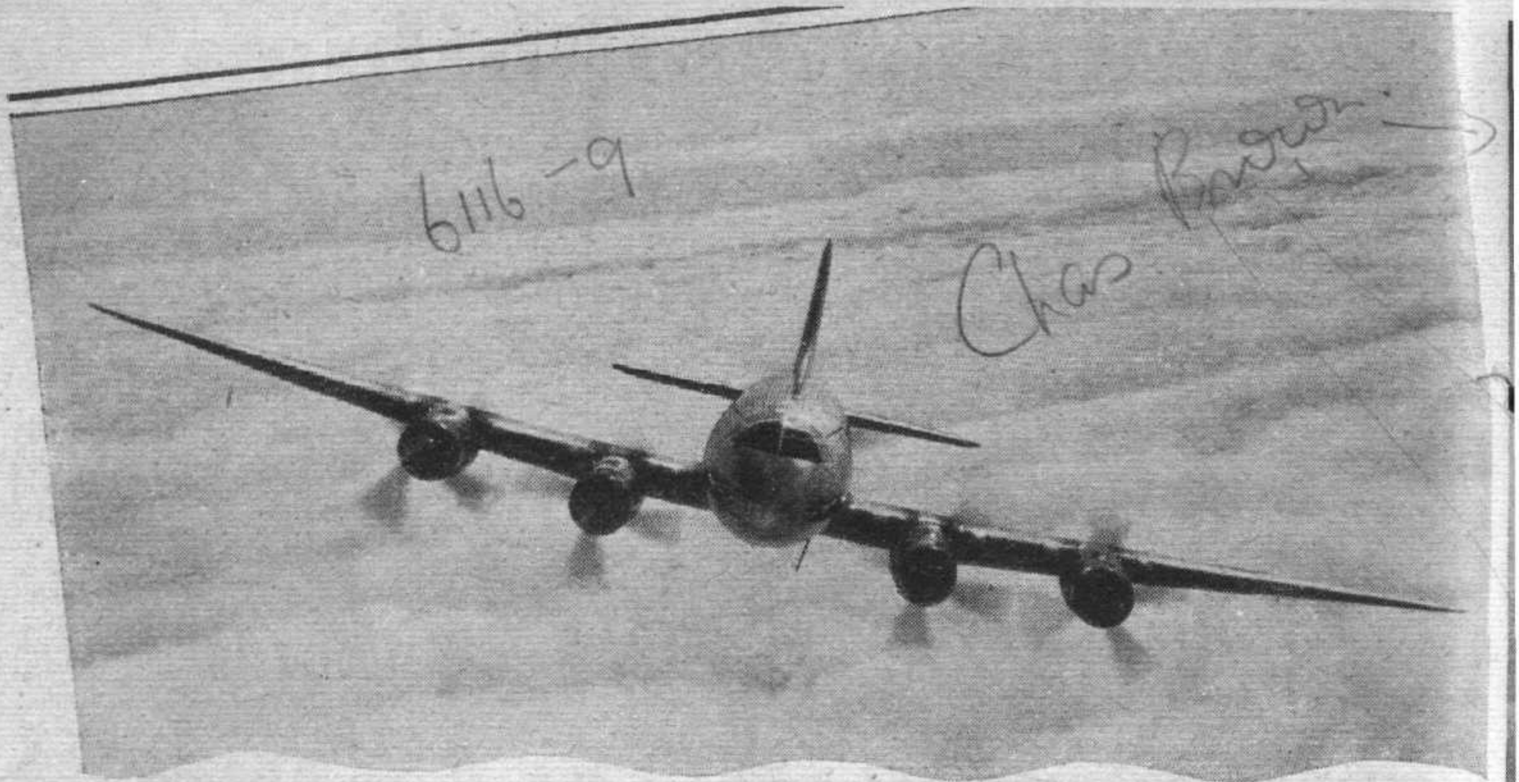
For variety, free and towed glider demonstrations were made by Mr. Hugh Bergel. Holders of "lucky" entrance tickets had free flights in the Aerovan while others paid for the privilege by subscribing their fare to the R.A.F. Benevolent Fund.


"Flight" photograph.

MILES ON SHOW: After a general fly-past, visitors to Woodley Airfield were able to examine all the aircraft taking part. The beautifully finished Marathon (centre) came in for a full share of praise.

The Marathon which had only been flying for a few days was demonstrated and many people were heard to remark upon its handsome, almost stately appearance in flight. By contrast the rugged-looking Monitor was demonstrated by Mr. Kendall, 2nd pilot of Miles Aircraft. With at least twice as much power from its two Cyclones as any other machine present its good performance on speed and climb was to be expected. However, as if ashamed to show off so much power among the little private-owner types, Mr. Kendall feathered an airscrew and proved beyond doubt that a failure of one engine need cause no alarm for a Monitor pilot. Earlier the Gemini too, with one airscrew stopped, was climbed, turned and finally landed, all apparently with the greatest of ease.

A word of thanks must be added for the excellent tea provided for all guests by the very energetic Reading and District Branch of the Royal Aeronautical Society.



Hermes/Hastings Prototype

Highly Successful Trials of Handley-Page Transport : Cruising Speed 300 m.p.h. : New Developments Announced

ON May 7th, six months after the first Hermes crashed on its maiden flight, the second prototype of the big Handley-Page transport flew at Wittering. Initial trials were completed in sixteen days of testing from the 2¾-mile runway and the machine was flown to Radlett for demonstration and supplementary tests. This in itself is satisfactory, but a cruising speed of 300 m.p.h., a top speed of 355 m.p.h., both considerably in excess of estimated figures, combined with unimpeachable handling qualities, have already placed the Hermes and its military variant the Hastings, in the front rank of the world's transport aircraft. The high speed is attributable not only to the aerodynamic cleanness and careful finish but to the design of such items as fillets and the ultra-modern engine installation, free of parasitic excrescences. Of special interest is the design of the wing fillet, with its sharp entry.

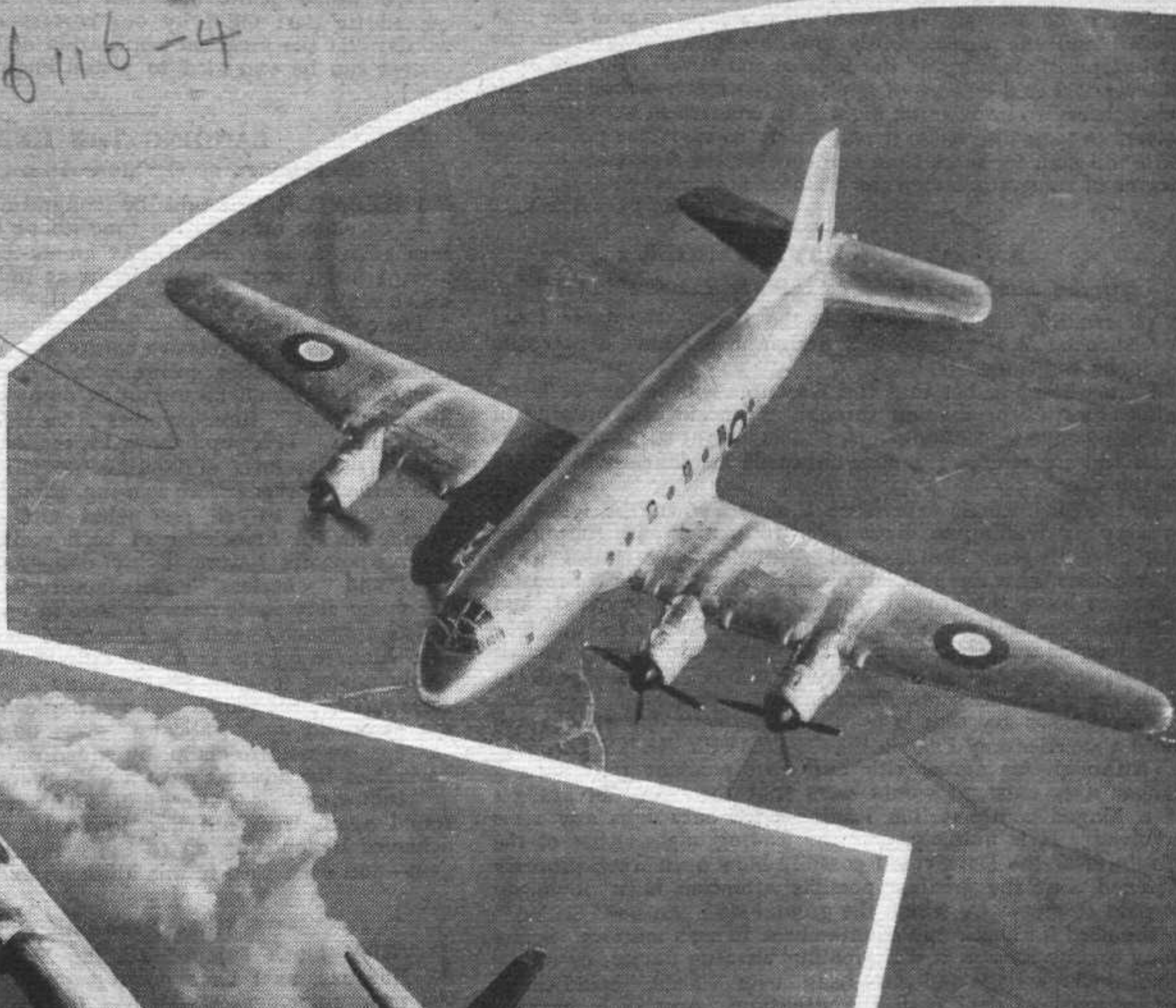
The machine now flying is essentially a Hastings, and the lavish internal appointments which will characterize the Hermes are not in evidence, but any airline operator who, like the C. in C. Transport Command, witnessed Monday's demonstration, would have been amply impressed by Sqn. Ldr. M. W. Hartford's display of flying qualities. Loaded to 60,000 lb the machine climbed initially at what seemed to be over 1,500 feet a minute, and according to the designer, Mr. Stafford, the climb at the maximum designed weight of 75,000 lb is at least 1,000 ft/min.

Pressurizing tests of a section of the Hermes passenger cabin have been successfully completed and the cockpit should have been proved by this time. No structural difficulties of any kind were presented and the pressurizing system itself is in the experienced hands of Westland Aircraft, Ltd. The oblong windows interspersed among the characteristic portholes are escape hatches.

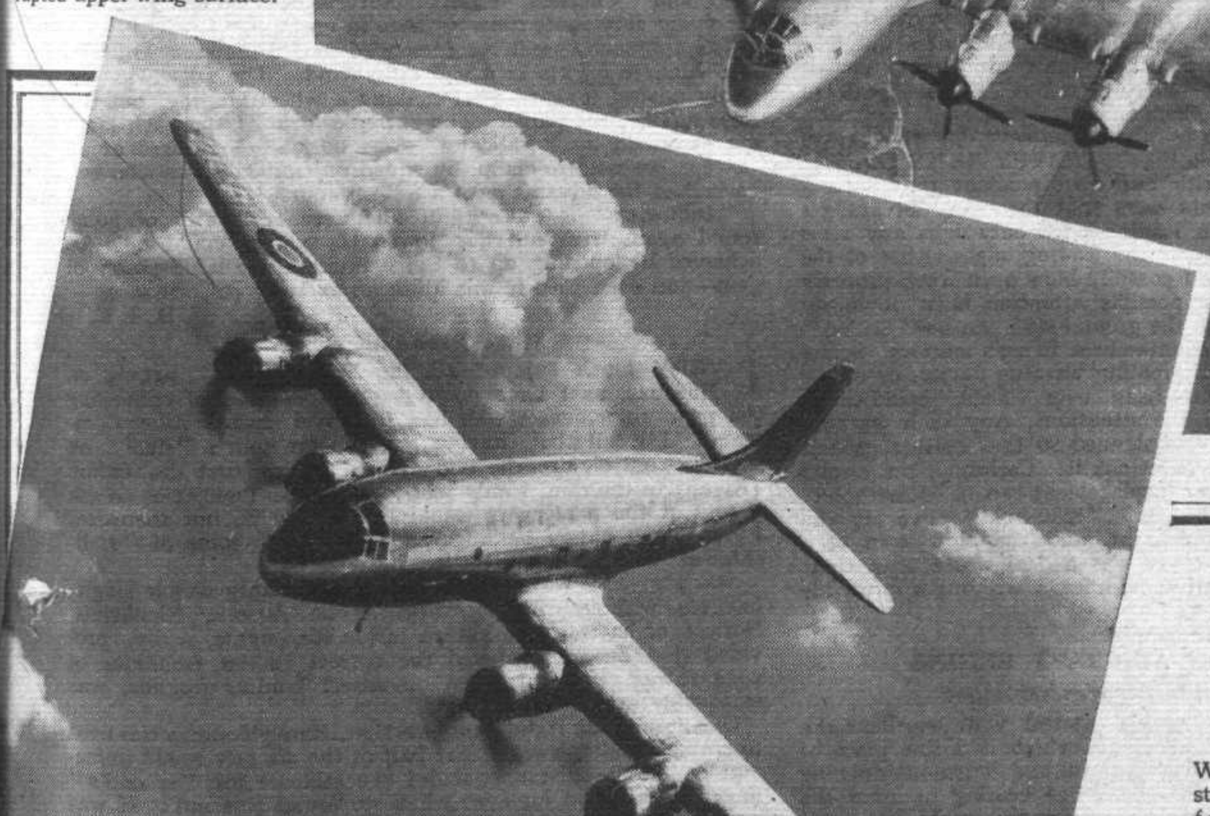
The table of initial flights reproduced below speaks for itself. Features of structure and accommodation have been dealt with in *Flight* of January 10th, 1946, and the Handley Page design staff has already been encouraged to proceed with new and even more impressive developments. Supplementing the present Hermes Mk I, the Mk II will have a fuselage 95ft 6in long (the present length is 82ft 2in), and an all-up weight of 80,000 lb. The pay load will be reduced by 2,600 lb, range by about 200 miles, and cruising speed by 10 m.p.h., but to offset this the new model will have accommodation for 64 passengers. Bristol Hercules engines will be retained, but in the Mk III version, which will likewise have the lengthened fuselage and fly at 80,000 lb, four Bristol Theseus turbine-airscrew units will raise the cruising speed to 355 m.p.h. at 30,000ft. Despite the increased consumption of the new power plant the maximum range will be over 2,700 miles.

RECORD OF FLIGHT TESTS

Date	Time of Flight	Weight	C.G	Purpose of Flight
7.5.46	33 m	54,377 lb	Forward	Maiden flight.
10.5.46	2 hr 25 m	,,	,,	Determination of longitudinal stability, power-on and power-off. Full handling tests of controls. Determination of stalling speed and aircraft behaviour at stall. Handling with outboard engines throttled.
10.5.46	1 hr 10 m	,,	,,	Further longitudinal stability tests. Level speed tests.
12.5.46	1 hr 5 m	,,	,,	Handling with elevator servo tab in operation. Handling with two engines throttled back on one side.
12.5.46	55 m	,,	,,	Handling by second alternative test pilot.
13.5.46	50 m	60,000 lb	Aft	Handling and stability with load arranged to give rearmost centre of gravity. Handling with increased weight and two engines throttled back on one side. Measurement of elevator trim over the speed range.
15.5.46	1 hr 20 m	,,	,,	Further handling, stability and elevator trim determination.
20.5.46	1 hr 25 m	65,000 lb	Normal	Handling and stability at increased load. Baulked landing test. Check with increased weight and two engines throttled back on one side.
22.5.46	55 m	70,000 lb	,,	Take-off measurements. Climb and level speed runs. Handling. Baulked landing. Check with maximum weight and two engines throttled back on one side. Handling by third alternative test pilot.
23.5.46	40 m	53,000 lb	Forward	Ferrying from R.A.F. Wittering to Radlett.
23.5.46	2 hr 05 m	54,000 lb	Normal	Handling, demonstration and photography.



Clean lines and a pleasant lack of minor protuberances characterises the Hastings/Hermes in its frontal aspects. The engines are underslung, leaving an almost uninterrupted upper wing surface.



With the two port engines stopped and the airscrews feathered, Sqn. Ldr Maurice Hartford, the Handley Page chief test pilot, has no difficulty in formating the Hastings on the photographic aircraft. The roof lights in the control cabin are a pleasant feature which is far from common in transport types.

CORRESPONDENCE

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

FLIGHT OF BIRDS

The Strongest Leads the Formation

IN answer to your correspondent's question about the "V"-formation flight of birds (*Flight*, May 9th), observation has confirmed the fact that the reason for this formation is aerodynamic. The leader of the "V" is the strongest bird, and the arms of the "V" contain birds that become progressively weaker towards the ends. The geese, or whatever they are, appear to be in some way aided by the slipstream of the bird ahead, and the weaker birds gravitate automatically to the easiest positions, i.e., at the tails of the "V." Incidentally, observers should beware of applying too much orthodox fixed-wing theory to ornithoptic flight. In connection with previous letters to your magazine, it may safely be said that no healthy bird will spin for more than one turn unless it intends to; the degree of control is far greater than on any fixed-wing aircraft.

A. R. FORREST.

AN ACCESSIBILITY DANGER

Hinged Leading Edges as "Potential Accidents"

ON reading the description of the Bristol Wayfarer I am shocked to see that a new design should have a potential accident built into it.

I am willing to bet that the Wayfarer will, sooner or later, fail to unstick or take-off through the accidental opening of a leading-edge inspection panel, and as long as such wing panels exist and are arranged to open outwards the danger will always be there.

In my own small experience I have known the following to happen: Wellingtons have failed to unstick with the refuelling covers open; Bostons and Blenheims have failed when fully loaded with the gills left open; I have known a Lancaster refuse to leave the ground when the leading edge lifted; and a Defiant crashed when the landing light panel blew out.

So long as quick-release panels are built into the top surface of a wing they must occasionally blow out. Cannot we learn from the past and screw them down?

The Chinese say that it is "better to save one life than to build a seven-storey Pagoda."

HAPPY TAKE OFFS.

[Although we agree with our correspondent that such a danger does exist, it would seem that the many advantages of a hinged centre-section leading edge outweighs any risks involved. It is unlikely that the leading edges either of the Wayfarer or the Dove could possibly blow open when properly fastened, but the greatest possible attention must obviously be paid to means by which the ground staff can be "drilled" in the need for check and countercheck in such matters. Something on the lines of a wing-folding warning device, or of the usual undercarriage and pitot-head cover "flags," could easily be arranged to deal with the situation. Any such warning system should, of course, be planned so that neither ground nor air crew could possibly overlook it. Certainly, the results of leading-edge distortion or displacement can be catastrophic. Even the departure of the tiny "man-hole" cover in the Spitfire fillet could be unpleasant, and the blowing-in of a Beaufighter landing-light cover was a deal worse than that. Yet gun-panels, further aft, could leave without appreciable results.—ED.]

THE JAMESON AIRCRAFT ENGINE

Very Creditable Figures Obtained

I HAVE read with considerable interest your excellent description of the Jameson engine, which is a fine piece of design and evidences some very careful and ingenious drawing office work. The figures are good, but bearing in mind the layout, I doubt whether engineers generally would go so far as to confirm your rather forthright statement that as a result of this design "*the reciprocating type of I.C. unit will be given a completely new lease of life.*"

The hypotheses, and the explanation of what occurs in the induction system seem also somewhat debatable, particularly in the absence of data regarding the valve timing. The progressive variation in mixture strength per charge, may or may not be obtained as per your diagram, and in all four cylinders, but the induction pipe length and its proximity to the hot cylinders is certainly a factor in the ability to burn lean mixtures.

The reason adduced for absence of wear generally, particularly on bearings and gears, may be to some extent questioned, as the horizontally opposed layout running on lean mixtures should have an inherently high durability.

However, it may very properly be contended that it is results that count rather than premises or speculations as to their causes, and the figures obtained are certainly very creditable.

"M.I.A.E."

[We would point out that the "forthright statement" quoted (in part only) by our correspondent began with the words: "If the practical application of the Jameson induction system can be extended to piston engines generally . . ."—ED.]

LANDING THE HUDSON

Divergence of Opinion Among Instructors

"INDICATOR" should be congratulated on yet another excellent article—this time about the Hudson and Ventura (*Flight*, May 16th). As an ex-Silloth instructor, however, I feel I must set him right as to the landing procedure which really was used at this O.T.U.

There was always a divergence of personal opinion between instructors as to the relative merits of "wheelers" and "three-pointers": the ruling generally laid down, however, was that "wheelers" should be taught at night and in cross-wind conditions, whilst "three-pointers" should be encouraged at all other times. If a pupil showed a tendency to cope nicely with one particular form of landing, no effort was made to force him into the other before solo-ing, though often, indeed, it was quite difficult to tell just what sort of landing was being attempted. A knowledge of both methods was desirable, as "three-pointers" were highly dangerous in a serious cross-wind, and "wheelers" unsatisfactory in no-wind conditions on the many very short runways then in use.

The approach speeds recommended varied between 80 kts in zero wind to 95 kts in a bad cross-wind. The stick was certainly pushed forward after making a wheel landing, but not right against the panel. The extreme form of approach landing described by "Indicator" was normally not used at all (except, we used to claim, by squadron-trained pilots who had never had the advantage of a Silloth course!).

"Indicator" is quite right about the difficulty of going round again with full flap lowered; success could only be achieved by opening up to the maximum available power of 45in—and even then it was quite an exciting performance.

D. I. C.

More Pros and Cons

I VERY much enjoyed reading "Indicator's" article on Hudsons, as I have many happy memories of conveying the poor unfortunates who had to travel around Aden Command. I recall that, having received an hour's "dual" on a single-control aircraft, and arrived at my first destination (Riyan) in the rain, I only just repressed an inclination to ask if any of the passengers would like to try it, but thereafter I had many happy landings and I do think some of "Indicator's" criticisms a little harsh.

Starting (in a warm climate) was reasonably simple single-handed, without the necessity, as on Ansons, Blenheims, Bothas, of having an assistant inside the engine, whilst, provided that one remembered the correct rudder technique of wing lifting, take off, even on desert landing-grounds, was reasonably safe.

One nasty trick it did have was that, if much engine was used to correct landing swing, that half of the aircraft would immediately become air-borne, and I can still see my "second's" fingerprints round his eyes when we found this out! It was quite common practice on just adequate runways to run up to about 2,200 r.p.m. against the brakes, let them off, and simultaneously finish opening the throttles, which does show that the take-off was not so bad. It is also possible, into wind, to perform at least one out of two landings with no use of brakes, provided that the tail was dropped gradually, and rudder used to the full. Much of the adverse criticism received by the Hudson was due to just plain old age, the accumulation of many coats of dope, and failure to fly on "Hudson" rules.

In any case I should like to thank "Indicator" for an interesting article, and I look forward to more—what about "A Spot of Botha"?

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New York–London Service

London Airport Opens Officially to International Traffic

(*Illustrated by "Flight" Photographs.*)

LAST Friday evening the American Ambassador, Mr. W. Averell Harriman, held a reception at Claridges which was attended in force by the Civil Aviation world from the Minister downwards. The reception marked the opening of direct air services between New York and London, and the consensus of opinion among operators and officials was that, in spite of all the difficulties, the first American airline operation into London Airport, which had taken place earlier that day, had been entirely successful.

London Airport's only brick-built building is the temporary control tower. Eventually, flying control facilities will be incorporated in a permanent building in the central terminal area.

Mr. R. S. S. Dickinson of the Ministry of Civil Aviation and Mr. Edwin C. Walton, European General Manager of American Overseas Airlines, greet General Harold R. Harris, Vice-President and General Manager of A.O.A. on his arrival.

As we showed last week, the passenger accommodation at the airport for these American services consists only of tents and caravans. Nevertheless, the Americans are apparently pleased with the result, and curiously enough, so were the passengers. This is all the more remarkable in view of the weather, for seldom can an airfield have been so thoroughly and completely baptized by the weather as was the one at Heathrow on its first official day as an international airport. A combination of high wind, driving rain and hail provided a most depressing spectacle. However, the tents did not leak to any considerable extent, neither did they blow down. As they are only a very temporary institution, they are not likely to have to withstand many buffetings of the kind which they received on May 31, even allowing for the vagaries of the English climate.

Twenty minutes after the deluge of rain had begun, two Constellations arrived, one belonging to Pan American World Airways and the other to American Overseas Airlines. They had left La Guardia Airport, New York,

The two Constellations at London Airport In the foreground is the American Overseas Airlines' Flagship and behind it the Pan American World Airways' Clipper.

N.Y.—LONDON SERVICE

within a few minutes of one another on Thursday afternoon, and they arrived at London Airport on schedule. The first to land was the Panair Clipper and it was followed in by the A.O.A. Flagship. A little later, the routine A.O.A. Skymaster also landed.

Amongst A.O.A.'s passengers was General Harold R. Harris, the Vice-President and General Manager of the company. The Panair machine brought with it Mr. Robert L. Cummings, the Manager of the Panair Atlantic Division. These senior executives of the two airlines both seemed satisfied with the temporary arrangements for traffic handling. As General Harris pointed out, the use of tents is more than compensated by the elimination of the tedious three-hour road journey from Hurn. The tents themselves had been made as comfortable as possible, and can be regarded as satisfactory as a strictly interim measure, provided that the construction of proper accommodation is begun and continued with all possible speed.

Apart from the American airline services, B.O.A.C. are also now using the airport. In fact, it was a B.O.A.C. Lancastrian which made the first landing last Friday. The Lancastrian had flown the 12,000 miles from Sydney, Australia, in 63¼ hours, arriving at London airport two hours ahead of schedule. British South American Airways have, of course, used London Airport regularly for all their services since the beginning of the year.

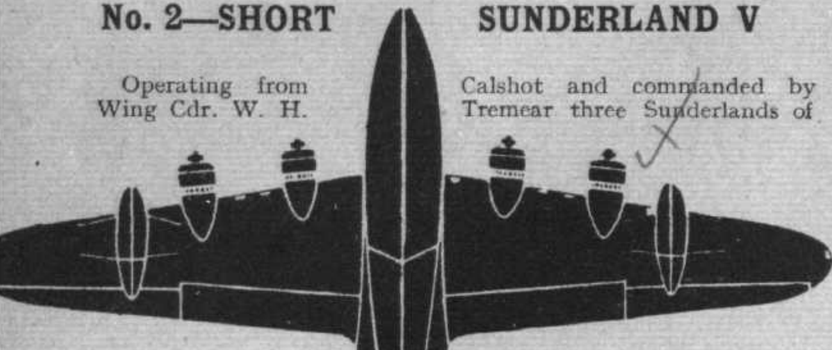
London Airport has now been opened to international traffic, primarily at the request of the American operators themselves. This has been made quite clear in various official statements. For example, the European general manager of the American Overseas Airlines has issued a statement emphasizing that the Ministry were pressed by the operators for an early opening of the airport to international traffic so as to eliminate the Hurn-London road or rail journey. He emphasizes, too, that the Ministry made it clear that nothing resembling permanent terminal facilities could be made available for the present, but that everything possible would be done to expedite full facilities.

The tents have been made comfortable with floors of clinker and sand covered with coconut matting. The buffet tent has comfortable chairs, a bookstall and facilities for sending cables.

More austere conditions prevail in the immigration tent. The screened-off cubicle at the back is the doctor's room.

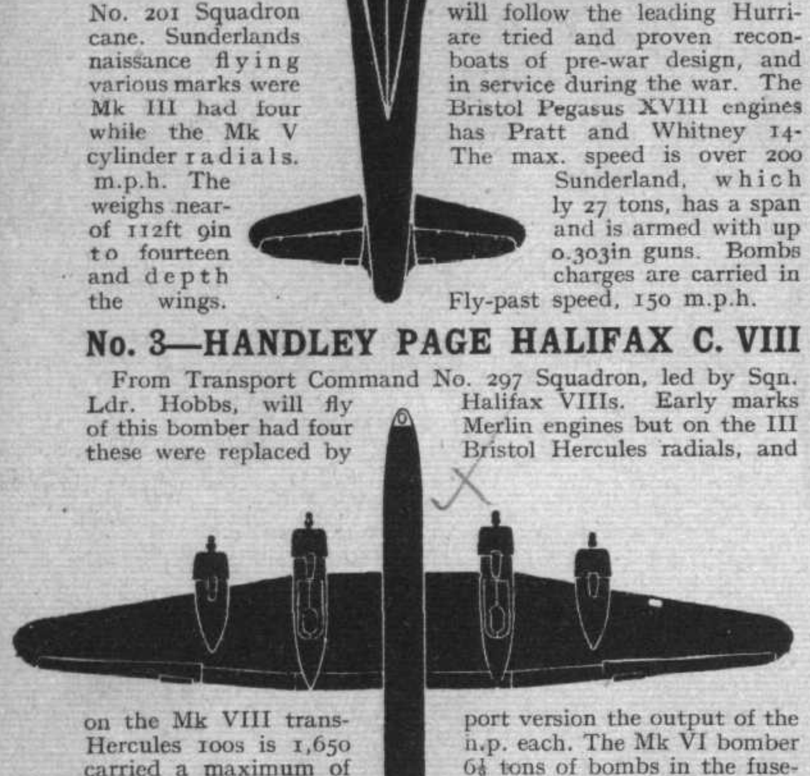
A general view of the tented camp which has been set up at London Airport as a traffic handling centre for transatlantic passengers The caravans in the background provide some of the office accommodation for the airline operating companies, and the telephone boxes in the foreground have been installed for the benefit of passengers.

No. 2—SHORT SUNDERLAND V



Operating from Calshot and commanded by Wing Cdr. W. H. Tremear three Sunderlands of No. 201 Squadron will follow the leading Hurricane. Sunderlands are tried and proven reconnaissance flying boats of pre-war design, and various marks were in service during the war. The Mk III had four Bristol Pegasus XVIII engines while the Mk V has Pratt and Whitney 14-cylinder radials. The max. speed is over 200 m.p.h. The Sunderland, which weighs nearly 27 tons, has a span of 112ft 9in and is armed with up to fourteen 0.303in guns. Bombs and depth charges are carried in the wings. Fly-past speed, 150 m.p.h.

No. 3—HANDLEY PAGE HALIFAX C. VIII



From Transport Command No. 297 Squadron, led by Sqn. Ldr. Hobbs, will fly Halifax VIIIs. Early marks of this bomber had four Merlin engines but on the III these were replaced by Bristol Hercules radials, and on the Mk VIII transport version the output of the Hercules 100s is 1,650 h.p. each. The Mk VI bomber carried a maximum of 6½ tons of bombs in the fuselage and wing centre sections, and it had an all-up weight of 65,000 lb. Stripped of military equipment the Mk VIII carries eleven passengers or twenty-four troops, and a large boat-shaped pannier fitted in the bomb bay will carry approximately 8,000 lb of freight. The dimensions are the same for the later marks except for a 2ft increase in length to 73ft 7in for the Mk VIII. The span is 104ft, the cruising speed 270 m.p.h. at 5,000ft. Fly-past speed, 185 m.p.h.

No. 4—AVRO LANCASTER III and VII

Representing Bomber Command in the fly-past, No. 35 Squadron will operate twelve Lancasters from Graveley. This squadron, commanded by Wing Cdr. J. L. V. Craig, D.S.O., D.F.C., has an invitation to take part in America in their Air Forces Day display on August 1st. The Lancaster is probably the most famous bomber ever built, and is powered with Rolls-Royce Merlin liquid-cooled engines (many of which were built under licence in the U.S.A. by the Packard Company). The two marks are similar but the VII is a long-range version developed for use in the Pacific theatre. The Lancaster measures 102ft in span and normally the max. weight is 68,000 lb. The bomb bay is 33ft long and accommodates about eight tons. A few special Lancasters have been modified to carry a 22,000 lb "Grand Slam." The standard armament for the Lancaster is ten 0.303in Browning guns, and the top speed is 275 m.p.h. Fly-past speed, 185 m.p.h.

V PARADE

Details of Squadrons and

SOME thirty-nine squadrons will be represented in the R.A.F. fly-past on V-Day, June 8th, and, weather permitting, aircraft of No. 1 Squadron will fly high overhead to produce contrails so familiar in Battle of Britain days. Although rehearsals have been in progress for some weeks, it will not be until the actual day that the full number of 304 aircraft form up and fly over. Practices on the V-Day route have been confined to skeleton formations only.

The squadrons will form up according to aircraft type and speed and will converge on Fairlop, near Romford, Essex, from the direction of Foulness on the coast. The first squadrons will move off from Ford, near Bognor on the South Coast, and Great Yarmouth on the East Coast, and in the case of the Naval aircraft from Ford, will follow the coastline round to Dover, collecting other squadrons at Eastbourne and Dungeness on the way. The East Coast group will fly to Stowmarket while others fly from Bentwaters and Boxted. Some of the jet fighters will operate from West Malling and will fall in behind the main Southern stream near Canterbu

Each stream will be under separate G.C.I. control during forming-

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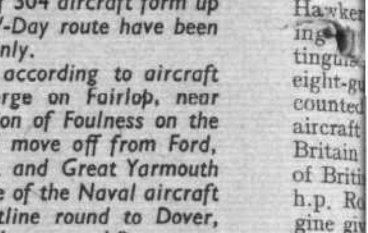
No. 5—D.H. MOSQUITO XXX, XXXIII, XXXVI

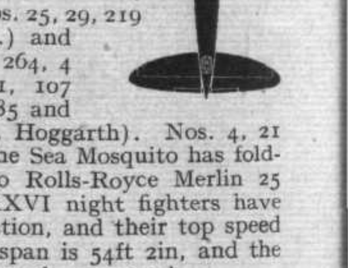


The Mosquito is the most successful twin-engine multi-purpose aircraft ever built, and examples (72 aircraft in all) will be flown over by No. 811 Squadron (Mk XXX Sea Mosquito), commanded by Lt. Cdr. S. M. P. Walsh, D.S.O., D.S.C., R.N.V.R., and by Nos. 25, 29, 219 (Sqn. Ldr. R. G. Wilkinson, D.F.C.) and 151 Squadrons (Mk XXX), and No. 264, 4 (Wing Cdr. M. P. C. Corkery), 21, 107 (Wing Cdr. W. C. Maher, D.F.C.), 85 and 248 (Mk XXXVI) (Wing Cdr. J. V. Hoggarth). Nos. 4, 21 and 107 are B.A.F.O. Squadrons. The Sea Mosquito has folding wings and is equipped with two Rolls-Royce Merlin 25 engines. The Marks XXX and XXXVI night fighters have Merlin engines for high-altitude operation, and their top speed at 30,000ft is over 400 m.p.h. The span is 54ft 2in, and the max. weight is 25,000 lb. Fly-past speed, 220 m.p.h.

No. 6—BRISTOL BEAUFIGHTER

The Beaufighter squadron will be No. 254 from Thorney Island. Hundreds of these aircraft were used from 1944 until the end of the war as night fighters, bombers, torpedo aircraft, and for low-level attack with mixed armament. The Beaufighter X has two Bristol Hercules engines, each giving 1,700 h.p., and due to the nature of its duty as a two-seat torpedo and rocket aircraft for day and night operation has a high speed (over 300 m.p.h.) at low levels. The armament is four 20 mm forward-firing guns, and the observer has a free 0.303in gun. The span is 57ft 10in, and the flying weight is 25,400 lb. The max. speed is 320 m.p.h. Fly-past speed, 220 m.p.h.

No. 7—BLACKBURN FIREBRAND IV



Operating from Ford, the nine Firebrand IVs of No. 813 Squadron are commanded by Lt. Cdr. Lee-White, M.B.E., R.N. Lt. W. Orr, R.N., senior pilot of the squadron which originally flew Fairey Swordfish, was the first pilot to make a deck landing at night on an escort carrier. Representing a new class developed for operation from aircraft carriers, the Firebrand is often called a "strike" aircraft. The engine is a Bristol Centaurus XI 18-cylinder radial developing 2,500 h.p., and this gives the Firebrand IV a top speed of 350 m.p.h. The armament of four 20 mm guns enables it to be used as a fighter, but it is also equipped to carry a torpedo or two 1,000 lb bombs. The span is 51ft 3in, and weight 16,230 lb. Fly-past speed, 220 m.p.h.

IN THE AIR

Aircraft in the Fly-past

and will be handed over for the fly-past itself to a special mobile station, sited in the Thames Estuary. As an aid in the event of unfavourable weather, a line of sodium lamps will be placed on roof-tops at approximately one-mile intervals on the route from Romford to the Admiralty Arch. There will also be a radar beacon on the Arch. An emergency plan has been prepared for a West-to-East flight should weather over the East Coast be too bad for forming-up.

Commencing at 1251 hours (one minute after the last of the troops has passed the King) with a single Hurricane, the flights will pass over the Admiralty Arch at approximately 20-second intervals until 1310 hours. The aircraft will hold their course over the Mall saluting base and Buckingham Palace and commence dispersal on reaching Kew. The forming-up is expected to take place at about 1,500 feet, but for the fly-past the aircraft will reduce height to 1,000 feet for a short distance.

The aircraft are illustrated in their scheduled order f appearance, and squadrons, names of Commanding Officers and other formation appears with the silhouettes which are to scale.

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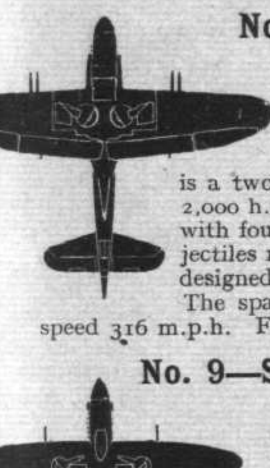
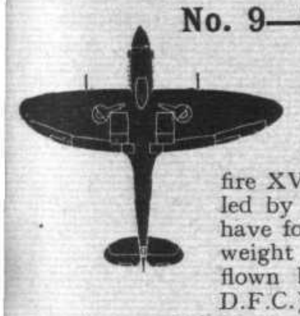


No. 8—FAIREY FIREFLY I

No. 816 Squadron, flying nine Fireflies, will be led by Lt. Cdr. J. M. Crabb, R.N. It was formed in 1939 and equipped with Swordfish, and at present is based at Lee-on-Solent. The Firefly is a two-seat Naval reconnaissance fighter with a 2,000 h.p. Rolls-Royce Griffon engine. It is armed with four 20 mm guns, and bombs and rocket projectiles may be carried under the wings, which are designed to fold for stowage in aircraft carriers. The span is 44ft 6in, weight 12,000 lb, and top speed 316 m.p.h. Fly-past speed, 220 m.p.h.



No. 9—SUPERMARINE SEAFIRE XVII, SPITFIRE XIV, XVI

Descended from the famous Spitfire I of Battle of Britain fame, these three marks are fitted with 2,000 h.p. Rolls-Royce Griffon engines. The nine Seafire XVIIs equip No. 807 Squadron, which will be led by Lt. Cdr. S. J. Hall, D.F.C., R.N. They have folding wing tips, a span of 36ft 11in, and a weight of 8,020 lb. Spitfire XIVs of the type flown by No. 65 Squadron (Sqn. Ldr. Foster, D.F.C.) shot down 300 flying bombs and the top speed is over 450 m.p.h. Spitfire XVIs will be flown by No. 587 and 691 (Sqn. Ldr. C. H. Macfie, D.F.C.) and 287 and 567 (Sqn. Ldr. D. F. Fenton). The span is 36ft 10in. Fly-past speed, 220 m.p.h.

No. 10—SUPERMARINE SPITFIRE IX

Two squadrons of Spitfire IXs, Nos. 164 (Sqn. Ldr. L. P. C. P. Farnes, D.F.M.) and 165 (Sqn. Ldr. K. C. Doran, D.F.C.), will operate from Middle Wallop, and another, No. 130 Squadron (Sqn. Ldr. F. G. Woolley, D.F.C.), from Manston. For certain duties the wings were clipped from 36ft 10in to 32ft 7in. The Mk IX with a Merlin 70 engine has a top speed of 415 m.p.h. Fly-past speed, 220 m.p.h.

No. 11—SUPERMARINE SPITFIRE XXI

No. 91 Nigeria Squadron (Sqn. Ldr. C. K Grey) and 41 Squadron (Sqn. Ldr. Lovell) will fly their Spitfire XXIs from West Malling and, weather permitting, No. 1 Squadron (Sqn. Ldr. H. R. Allen, D.F.C.) will also use XXIs at very high altitude to produce contrails. Among the fastest airscrew-driven fighters in the world, the Spitfire XXI with Rolls-Royce Griffon engine has a max. speed of 450 m.p.h. Five-bladed or contra-rotating airscrews may be fitted. Fly-past speed, 290 m.p.h.

No. 12—D.H. HORNET

Only one squadron of nine Hornets will take part in the fly-past and these will be operated from Horsham by pilots of No. 64 Squadron. The fastest twin-engine airscrew-driven fighter in the world, the Hornet has two Rolls-Royce Merlin 130 series engines, each of 2,030 h.p. In certain respects the design resembles the Mosquito, but dimensions are smaller. The span is 45ft and the flying weight 17,600 lb. The Hornet, designed for service in the Pacific theatre, has a max. speed of 473 m.p.h. and a range of 2,900 miles. It is armed with four 20 mm guns and can carry two 1,000 lb bombs or eight 60 lb rockets. Fly-past speed, 290 m.p.h.

No. 13—HAWKER TEMPEST II

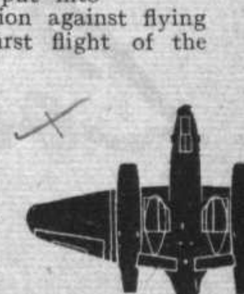
No. 54 Squadron from Chilbolton, led by Sqn. Ldr. F. W. M. Jenson, D.F.C., A.F.C., will fly over in nine Tempest IIs. The Hawker Tempest is a larger and more powerful fighter than the Spitfire and was developed from the famous Typhoon which distinguished itself during the later phases of the war in low-level attacks with rockets, guns and bombs. The Mk II version, originally intended for service in the Far East, is fitted with a Bristol Centaurus V 18-cylinder radial engine giving 2,500 h.p. The span is 41ft and bomb load 2,000 lb. Fly-past speed, 290 m.p.h.

No. 14—HAWKER TEMPEST V

Three squadrons of Tempest Vs from B.A.F.O. will be seen and these will be operated from Manston by No. 3 (Wing Cdr. J. C. Button, D.S.O., D.F.C.) and Nos. 16 and 33 Squadrons. Fitted with a 24-cylinder Napier Sabre liquid-cooled engine of 2,400 h.p., the Tempest V has the same armament as the Tempest II, and was particularly successful in action against German flying bombs due to its high speed at low altitude. The max. speed is 435 m.p.h., the span 41ft, and with two 1,000 lb bombs the all-up weight is 13,500 lb. Fly-past speed, 290 m.p.h.

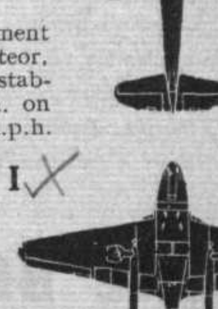
No. 15—GLOSTER METEOR III

Six squadrons of Meteor twin-jet fighters based at Bentwaters and Boxted will follow the Tempests. These are Nos. 56 (Sqn. Ldr. F. W. Harrison), 74 (Sqn. Ldr. J. R. Cooksey commanding), 245 (Sqn. Ldr. P. M. Gardner, D.F.C.), 234 (Sqn. Ldr. J. R. Plagis, D.S.O., D.F.C.), 222 (Sqn. Ldr. C. C. F. Cooper), and 263 (Sqn. Ldr. J. Brant). Two versions of the Meteor III are expected over London, differing only in the length of the nacelles for the Rolls-Royce turbine-jet units. The Meteor was the first jet-propelled fighter to be put into service with the R.A.F., and was in action against flying bombs less than 18 months after the first flight of the prototype.



GLOSTER METEOR III
(EXTENDED NACELLES)

The latest development, the Meteor IV with Rolls-Royce V turbine-jet units, has a speed of 585 m.p.h. with full military equipment. The Meteor is armed with four 20 mm guns and has a span of 43ft. Longer engine nacelles have been fitted to certain Mk III and all Mk IV aircraft for the attainment of higher speeds, and it was a Mk IV Meteor, flown by Group Capt. H. J. Wilson, which established the world's speed record of 606 m.p.h. on November 7th, 1945. Fly-past speed, 350 m.p.h.



No. 16—D.H. VAMPIRE I

The last aircraft to fly over will be nine Vampires of No. 247 Squadron commanded by Sqn. Ldr. C. Scott-Voss, D.F.C., and operating from West Malling. The first single-jet fighter to be adopted by the R.A.F., the Vampire is distinguished by its twin tail booms. Its D.H. Goblin jet unit gives it a speed of 540 m.p.h. with full military equipment including four 20 mm guns. The Vampire is extremely manœuvrable, and the Sea Vampire was the first jet aircraft to be operated from an aircraft carrier. The span is 44ft and the weight 10,300 lb. Fly-past speed, 350 m.p.h.

Looking forward...

The tributes paid to Hubert Scott-Paine and the British Power Boat Company in recognition of the fact that at the outbreak of war their M.T.Bs., M.G.Bs. and R.A.F. Rescue Launches were already in service and closely followed by others under construction . . . for the availability of the 500 h.p. "POWER"-Napier Sea Lion Marine Engine, and the now-famous Packard Machinery which formed the motive power for so many of the Country's Light Naval Fighting Craft . . . all these give the natural satisfaction of a job well done.

Now, together with the rest of the World, we look forward to the time when our boats and machinery will again take up their peacetime occupations . . . running the pilot ashore . . . transporting the doctor . . . dealing with waterside fires . . . meeting the 12 o'clock flying boat from the States . . . providing rapid transport for the public and pleasure to the private owner in leisure moments. We remember, even so, that until all threat of War is removed, our swift fighting craft must maintain their undoubted leadership

THE BRITISH POWER BPB BOAT COMPANY LTD.

CONSTRUCTORS OF SCOTT-PAINE SURFACE CRAFT

HYTHE SOUTHAMPTON ENGLAND

Coaches ply regularly between London and Northolt with Continental passengers who are seen embarking in a B.O.A.C. Dakota.

"Flight" photographs.

The airport manager, Group Captain W. S. Caster, M.C.

Northolt Airport

London's Airport for Continental Services : Converting a Maze of Huts into an Air Terminal

THOSE who wonder whether any effort is really being made to put this country's air transport on the map should give up reading *Hansard*. It is too depressing. Instead, they should pay a visit to Northolt any morning at about 8 o'clock. There they will find an orderly line of passenger aircraft—for the moment all Dakotas—and, in normal conditions, they will see these aircraft take off one after another at their scheduled times with a complete absence of fuss, and with an almost monotonous regularity.

From this one might be lead to believe that Northolt was one of the more favoured of our airports from the point of view of passenger-handling facilities, but it is not. Indeed, although according to the recent statement in the House of Commons by the Under-Secretary of State for Air, Northolt is now a civil airport, the R.A.F. is still triumphantly in possession of the bulk of the permanent and good accommodation, whilst the civil operators, as can be seen by anyone who passes up and down that part of Western Avenue, are operating from a cluster of temporary huts.

Even the Minister of Civil Aviation admits that temporary hutting is not the right kind of accommodation for civil airline passengers, but for so long as priorities in labour and materials must be directed to housing the homeless, it is inevitable that, even at our major airports, a good deal of makeshift accommodation must be endured. That it can be endured, and further, that on a temporary basis it can be turned into an efficient passenger-handling unit, is certainly proved at Northolt. Although the traffic-handling building there is, at first acquaintance, rather like the Hampton Court maze, it has nevertheless been made to work effectively; in fact, so effectively, thanks to the narrow corridors, that it is a veritable sausage-machine, and once a person is committed either to the incoming or the outgoing passenger channel, there is little chance that he or she will take the wrong path.

Organization Under Difficulties

Credit is due to B.O.A.C., whose European division is now operating the services at Northolt, and also to the division's local traffic superintendent, Mr. Clive Adams, for making the best of a bad job in what have been the most difficult circumstances. The existing collection of

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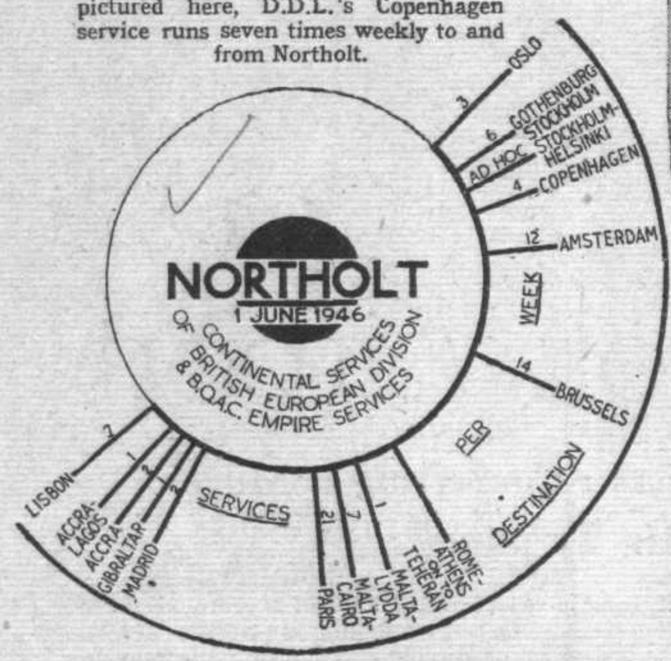
NORTHOLT AIRPORT

In addition to the regular British services pictured here, D.D.L.'s Copenhagen service runs seven times weekly to and from Northolt.



huts—or, as it is known, the "traffic-handling unit"—can cope easily with one service in or out every ten minutes, and, under peak conditions, could probably be made to absorb even more passengers. However, a second of these traffic-handling units is now in course of construction and should be finished within a couple of months. In addition, a restaurant capable of seating three hundred people is being incorporated in the design. This will be of tremendous benefit, for, at present, all food is prepared in one small kitchen about twenty feet square, to the tune of some 250 lunch boxes and 400 or more buffet snacks each day.

Each day too, a total of some 350 to 400 passengers pass through the civil side of the airport, and 10,000 lb or so of mail and freight is handled, the latter in a converted blister hangar. In addition to the British European Division services, and D.D.L.'s daily service to Copenhagen, the B.O.A.C. services to the Middle East and to

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A TYPICAL THURSDAY'S TRAFFIC PROGRAMME

OUT Time	OUT Destination	IN Time	IN Destination
0840	... Rome	1315	... Copenhagen
0900	... Stockholm	1330	... Cairo
0920	... Brussels	1415	... Paris
0940	... Amsterdam	1420	... Amsterdam
1000	... Paris	1550	... Stockholm
1020	... Lisbon	1615	... Brussels
1040	... Copenhagen	1630	... Lisbon
1100	... Cairo	1745	... Paris
1145	... Lagos	2005	... Copenhagen
1300	... Paris	2020	... Amsterdam
1400	... Cairo	2115	... Brussels
1415	... Copenhagen	2145	... Paris
1515	... Amsterdam		
1700	... Brussels		
1730	... Paris		

West Africa are now using Northolt until such time as they can transfer to the London Airport. There are also, from time to time, the odd *ad hoc* services of foreign airlines which step up the traffic even higher, particularly as Northolt is regarded as the first diversion airfield for all foreign airlines.

Accommodation Shortage

The major problems at present are the lack of sufficient administrative buildings to accommodate the offices of the various airlines which might otherwise transfer their services to Northolt, and also certain operational limitations which make life unnecessarily difficult. Amongst the latter is the presence of the meteorological office on the far side of the airfield, necessitating an overall journey of some four miles every time an aircrew has need to visit it. However, when the large administrative block at present under construction is completed, office accommodation and full facilities for briefing, met. offices and the like, should be available on the civil side of the airfield.

Fortunately, the aircraft parking area is now of sufficient size to cope reasonably with present movements, and, when the extensions to the tarmac are completed, there should eventually be parking space for a very large number of aircraft. C.S.W.

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"Flight" photographs.

1. Passengers arriving from London at the temporary traffic building.
2. D.D.L. Condor and B.O.A.C. Dakotas side by side on the hardstanding.
3. Mr. Clive Adams, Airport Traffic Superintendent for the British European Division.
4. Passengers in the buffet awaiting their call to the aircraft.
5. A load of clothing and paint being checked in the freight shed before it is flown to Brussels.
6. Luggage being off-loaded into an American "Clark" fork truck from the Stockholm Dakota.

CIVIL AVIATION

Reduced Fares : B.O.A.C's Constellation Service : Airport for Glasgow : More Air Agreements

ON THE TARMAC : The Bristol Wayfarer as seen from the control room of Jersey Airport. The first of the Wayfarers is expected to go into service with Channel Islands Airways in time for the summer traffic.

"Flight" photograph.

FOR AUSTER OWNERS

IN case there are any owner pilots or ground engineers who do not ordinarily see the Air Registration Board's Notices, No. 11 of Issue I to such should be treated with urgency. Apparently there have recently been two cases of aircrew bolt failure with Auster V J1s, and the notice in question gives details of these and explains the checking procedure.

NEW YORK TO VIENNA

IT is reported that Pan American World Airways are beginning next week a twice weekly service from New York to Vienna, departing from New York on Thursdays and Saturdays. The first service is due to leave on June 15th and is scheduled to reach London on the 16th and continue via Brussels and Prague to Vienna on the same day.

FAR EAST MISSION

ARRANGEMENTS for the opening of the proposed U.K.-Far East service, the ultimate destination of which is Tokyo, are being made by a B.O.A.C. mission headed by Lord Burghley which is visiting the Far East. The mission, which includes Mr. R. D. Stewart, Assistant Director General (Commercial) and Air Vice-Marshal Sir Victor Tait, Assistant Director General (Technical) will investigate the provision of communications, and of meteorological and landing facilities.

B.O.A.C. QUARTERLY

A NEW quarterly magazine in colour, *Wings Over the World*, has been produced by B.O.A.C. It is intended primarily for circulation to senior executives of business firms and for members of organizations concerned with the export trade or interested in air transport, who, subject to the inevitable restrictions of paper supply, can become regular recipients of the magazine.

The first issue ranges over subjects as varied as "Gas Turbines for Civil Aircraft" and "Fashions from Britain," and includes an "Air Quiz." The magazine is well produced, with plenty of illustrations, although the colour in this first issue tends to overshadow the quality of these pictures.

ANGLO-ARGENTINE AGREEMENT

UNDER a new ten-year Agreement between the U.K. and the Argentine Government, reciprocal air services can be operated between their respective territories. The Agreement enables British South American Airways to operate routes, via Lisbon or other intermediate points, to Buenos Aires, provision being made for an extension to Uruguay, and also, via Lisbon and/or other intermediate points, to Santiago, either directly over Argentine territory, or via a designated airport or airports in Argentina.

In return, the Argentine Airline (F.A.M.A.) can operate to and through British territory from Buenos Aires, via one or more intermediate points, including Bathurst (if desired), Lisbon, and/or a point in France, to London or any other designated airport in the U.K. F.A.M.A. is also granted the right to operate over the same route to the U.K. and thence to agreed points on the European Continent.

B.O.A.C. ATLANTIC SERVICE

A TWICE-WEEKLY service in each direction across the North Atlantic is planned by B.O.A.C. to open on July 1st using the first of the Corporation's much-discussed Constellation aircraft. At first, the route will be from London Airport via Rineanna and Gander to New York, but when the services have reached a frequency of four per week each way, one of them will be routed via Prestwick. Ultimately, when the service becomes a daily one, five each week will go by Rineanna, and two via Prestwick.

LOWER FARES

AT the beginning of this month, a considerable reduction in B.O.A.C.'s fares came into effect on the trunk route service to Cairo and beyond. In addition the luggage allowance on these routes has been increased from 44 to 66 lb. The new rates represent only a preliminary adjustment as a first step towards the introduction of B.O.A.C.'s complete post-war programme and even lower fares. The present adjustment in rates is as follows:

	£ New	£ Old		£ New	£ Old
U.K.-Cairo	65	85	Cairo-Karachi	65	66
U.K.-Basra	90	128	Cairo-Singapore .. .	120	122
U.K.-Karachi	120	151	Cairo-Sydney	220	230
U.K.-Calcutta	140	163	Karachi-Singapore ..	73	75
U.K.-Singapore	170	207	Karachi-Sydney	178	183

The reduction in the U.K.-Cairo fare will result also in a corresponding reduction in the fares from U.K. to a number of points in East and South Africa, such as Mombasa and Durban.

RENFREW

THE Minister of Civil Aviation intends Renfrew Airport to be an important operations and maintenance base for British European Airways. This was disclosed by Mr. Ivor Thomas in a written answer to a recent question by Mr. Rankin. The Parliamentary Secretary's reply said that already the airport was the centre of a network of airlines, and it was planned to expand this network so that Clydeside would be connected with the main centres of population in the United Kingdom, and with the Orkneys, Shetlands and the Western Isles. Services were also planned which would connect Renfrew direct with the Continent.

Before the war, continued the reply, Renfrew was a comparatively small grass airfield, but it had been greatly extended during the war and now had two hard-surface runways, 1,950 and 1,300 yards long respectively. A third runway of 1,350 yards was considered desirable, but was, at present, the subject of negotiations owing to the approach to the new runway interfering with a proposed extension of the Hillington industrial

Flashback

" Remember the day we nearly pranged the old kite when flaps failed and we touched down at 120? We certainly stood on our brakes that day! Good old Leo FERODO!"

Knowledge gained in war applied to the safety and comfort of passenger aircraft in peace. Ceaseless research and long experience in the manufacture and application of Friction Materials. These are factors contributing to the superiority of FERODO products and are the reasons why they feature prominently in modern specifications.

FERODO

BRAKE LININGS

for Aircraft

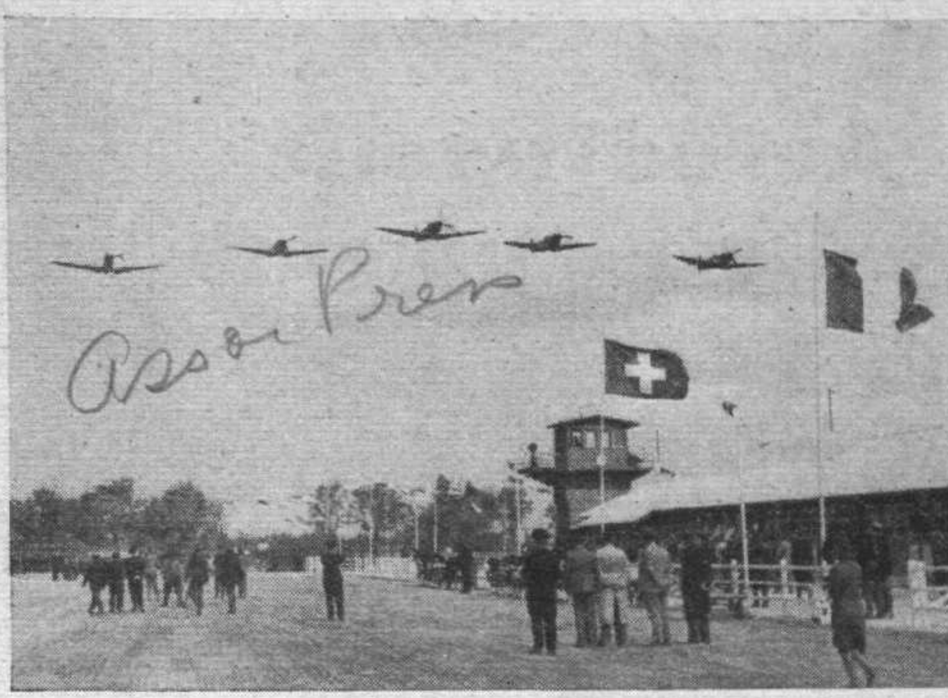
FERODO LIMITED • CHAPEL-EN-LE-FRITH

FERODO REGD. TRADE MARK

CIVIL AVIATION

estate. However, the Housing Committee of the Glasgow Corporation had recommended that the corporation should concede an alternative site for the estate extension. Difficulty had also arisen over the need to restrict the height of buildings in the approaches to existing runways, but it was hoped that the matter would be settled in such a way that the Ministry of Civil Aviation could make Renfrew an airport worthy of the great city which it served.

Mr. Thomas pointed out that, in the past two years, there had only been two days on which the airport was closed to traffic, and also that, since 1939, there had been two accidents at Renfrew to civil aircraft resulting, in one case only in slight injuries.



ALSATIAN AIRFIELD : Tricolor and Swiss National flag flew side by side when the Basle-Muelhausen airfield was opened on Alsatian territory on May 8. The temporary airfield, with its 1,200-metre steel runway was built in six weeks.

OTHER AIRPORT NEWS

THE following news about airfield and flying boat base developments was given in written answers to questions in the House of Commons by the Parliamentary Secretary to the Ministry of Civil Aviation on May 22 :—

TURNHOUSE

As soon as existing buildings have been modified and the necessary technical facilities installed, Turnhouse will be used for scheduled air services operated by British European Airways. Edinburgh will then be linked by air to most of the main centres in the United Kingdom, and, at a later date, to the Continent. Much work will be involved in adapting the airfield to civil use, but plans have been made and will be put into effect with high priority.

PRESTWICK

A preliminary survey has been completed for the provision of a new second runway. As a result, it has been decided that a detailed engineering survey must be carried out as soon as staff is available. Although the existing runways have already been used by Constellations, it must be ascertained whether they would stand up to intensive use by heavy aircraft.

MARINE AIRPORT SCHEMES

Development schemes for many different places have been received by the Ministry and considered, including Loch Ryan and the Firths of Clyde, Forth, and Tay in Scotland, Lough Neagh in Northern Ireland, Milford Haven in Wales, Langstone Harbour and the Thames Estuary in England.

WEST INDIES MUDDLE

THE report of a proposed agreement granting a Canadian airline monopoly for four years between Montreal and Bermuda has met with an odd reception in the West Indies. While Sir William Murphy, the Governor of the Bahamas, says that it is a correct report of Colonial Office information, Admiral Sir Ralph Leatham, the Governor of Bermuda, asserts that any such proposals are merely recommendations to the respective Governments concerned, and that Bermuda is reserving the right to run reciprocal services if the Canadian services prove unsatisfactory. It appears to be another of those (dis)agreements.

DISPUTE SETTLED?

THE word "exclusive," which has caused so much diplomatic heartburn over the proposed agreement, between Italy and Trans World Airlines of America, to form a joint company to run civil air lines in Italy, is to be dropped out of the agreement. Originally, as explained in these columns on May 2nd and May 23rd, the agreement aimed at granting T.W.A. "exclusive" rights for such services, but now that the Italian Government has agreed to drop the offending adjective, the U.S. State Department will, one presumes, urge the Italian Government to implement the contract. The door is now open for the British Government to urge Italy to make a contract on similar lines with the U.K. for the benefit of British European Airways; in fact, it is understood that discussions are well in hand. One hopes that the cupboard will not prove to be bare.

SCALED-DOWN STRATOCRUISER

IN addition to the Stratocruiser—which, from all accounts, is likely to be the outstanding American civil aircraft of the immediately post-war generation—Boeings are starting the production of a smaller version for more local services. This, the 417, is a twin-engined high-wing 20-24-passenger type. It will have a span of 86ft, and the equipment will include thermal de-icing and cabin conditioning—though not, presumably, pressurization. The engines are to be Wright Cyclones.

BREVITIES

INITIAL steps are being taken for an air service to link Australia with the Philippines. Australian National Airways already operates a charter service for the United States Army from Brisbane, to Manila, using D.C.3 aircraft, which leave Brisbane daily and fly via Townsville, Port Moresby, Finschafen, Hollandia, Biak, Morotai, and Leyte.

* * *

The opening of a service by Czechoslovak Airlines, linking Prague and Amsterdam, has re-established air communication between London and Prague.

* * *

Under a mutual agreement reached between Canada and Newfoundland, the air bases at Gander, Gleneagles, and Botwood are returned to Newfoundland. Torbay will be used by Canada for civil or military purposes as required.

* * *

At the end of last month the first of B.O.A.C.'s Constellations was flown into La Guardia Airfield, New York, by Capt. L. V. Messenger, O.B.E. With him were, amongst others, Mr. Vernon Crudge and Capt. Kelly Rogers, O.B.E.

* * *

Air-mail letters may now be sent to French Indo-China at 1s 3d per half ounce (postcards 7d). For Cambodia and Cochin China the weight limit for letters is 1 lb and for other districts, 1 oz. Registration facilities are available only to Cambodia and Cochin China.

* * *

Mr. Robert Stuart Pilcher, C.B.E., F.R.S.E., M.Inst.T., who is General Manager of the Manchester Corporation Transport Department, and who is to become Regional Transport Commissioner for the Midland Area from July 1, has been elected President of the Institute of Transport for the year beginning on October 1 next.

* * *

From July, 1941, until the end of the war total payments amounting to some £245,000 were made to Scottish Aviation, Ltd., for catering at Prestwick Airport—according to a written answer given by the Under-Secretary of State for Air recently. This Air Ministry wartime catering contract was, however, mainly concerned with the messing of airmen stationed at Prestwick.

Recent Aerodynamic Developments

THE 34th Wilbur Wright Memorial Lecture was delivered before the Royal Aeronautical Society by Mr. E. F. Relf on Thursday, 30th May, under the chairmanship of Sir Frederick Handley Page, president of the Society. Mr. Relf joined the scientific staff of the Aerodynamics Department of the National Physical Laboratory in 1912. He has done research work in all branches of aerodynamics and was superintendent of the Department for many years until his appointment early this year as principal of the new College of Aeronautics.

LECTURE By E. F. RELF, C.B.E., F.R.S., F.R.Ae.S.

IT was with the greatest pleasure that I accepted the invitation of the Council to deliver the Wilbur Wright Lecture this year. I feel we are on the verge of discoveries and advances almost as spectacular as that flight of Orville Wright's forty-three years ago, and that my peculiar experience may enable me to present to you some of the results of recent researches which have led me to the above somewhat prophetic conclusion.

I propose to discuss in turn several lines of recent thought and experiment in aerodynamics which seem to me to be pregnant with possibilities for the future.

When I had the honour to give the James Forrest lecture in 1936 I made this remark: "The revolutionary discovery we need as regards surface friction is to find a means to make the

Laminar flow maintained in boundary layer so long as mass flow is accelerating.

boundary-layer flow remain laminar over a much greater proportion of the surface, or in other words, to prevent turbulence from developing in the boundary layer itself."

Not I, nor anyone else, could at that time imagine how this retention of laminar flow was to be achieved, but we now know that the underlying principle is simplicity itself, as is often the case with fundamental new discoveries. Although we cannot yet see the way to reduce drag to the mere 10 per cent of complete laminar flow, we can clearly see how to attain very substantial reductions.

The basic principle involved here is that there is no tendency for laminar boundary layer flow to break down into turbulence as long as the flow outside the boundary layer is accelerating, provided also that there are no violent disturbances of an external nature such as those due to turbulence in the fluid itself. It is therefore only necessary to ensure that the point of maximum suction shall be as far back as possible along the chord of a wing or the length of a streamlined body in order to retain a laminar boundary layer at least up to that point.

There was some experimental indication of this possibility at least as long ago as 1939 but the significance of the result was not grasped. A test of an aerofoil designed by Dr. Piercy, having its maximum thickness at 40 per cent of the chord, was made in the compressed air tunnel at the National Physical Laboratory. It showed considerably lower drag than that of previous aerofoils at low Reynolds numbers, but at high Reynolds numbers there was no gain. The drag curves are shown in Fig. 1. We now know that these effects were due to a more extensive laminar boundary layer, which, however, could not be maintained at high Reynolds numbers because of the high tunnel turbulence.

The true position was first grasped by our American friends, who realized the importance of experimenting in a very steady airstream and proceeded to design a wind tunnel with as low a degree of turbulence as possible. In this they tested many aerofoils designed to have

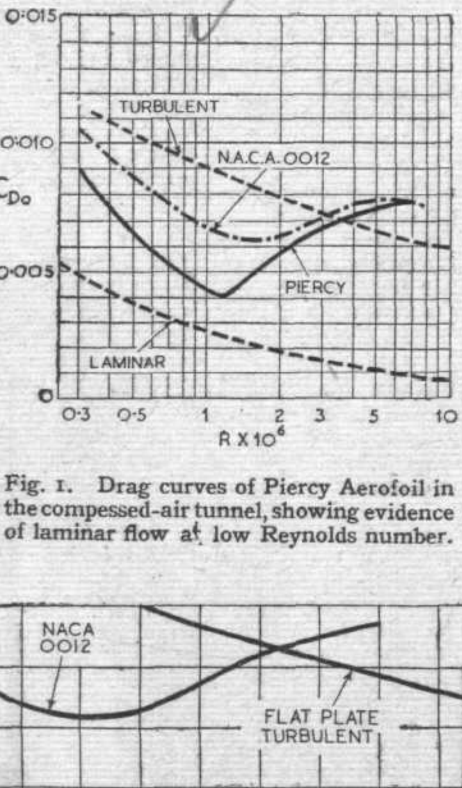


Fig. 1. Drag curves of Piercy Aerofoil in the compessed-air tunnel, showing evidence of laminar flow at low Reynolds number.

a rising velocity along the greater part of the chord, and the results definitely proved the possibility of extensive laminar boundary layers, even at the Reynolds numbers of flight. At the time we, in this country, heard rumours of curiously shaped wings with cusped trailing edges, and wondered what it all meant. This was early in the war, before the later excellent arrangements for interchange of information had been made. Before long we began to experiment for ourselves, not at first in a wind tunnel, but by mathematical means.

The development of these means was largely the result of the efforts of Professor S. Goldstein, F.R.S., who thoroughly explored the available methods for calculating the velocity distribution on a two-dimensional body and soon discovered good approximations to the reverse process of calculating the shape which would give a specified velocity distribution. This at once led to

British laminar aerofoils evolved from pure potential theory.

the design of aerofoils having a nearly linear increase of velocity from a point quite near the nose back to the point of maximum suction, which latter could be arranged to lie at any desired point along the chord. It was thus that the first British family of laminar flow aerofoils was born of pure potential theory, afterwards to be tested in the only tunnel we had that was at all suitable for the purpose, and rather a poor one at that compared with its American counterpart.

The first successful experiment in this country was, however, made before the theory had been developed. Realising that an elliptic cylinder has its maximum suction at half-chord, an aerofoil was designed, the front 60 per cent of which was elliptic while the back 40 per cent was a cubic curve arranged so as to join the ellipse smoothly and to give a sharp trailing edge. The results of a test of this aerofoil in the 13ft × 9ft tunnel of the N.P.L. are shown in Fig. 2, mainly for their historic interest. It is seen that the lowest drag coefficient obtained was 0.0029 at a Reynolds number of 5×10^6, but that at higher Reynolds numbers the tunnel was not "good enough" as regards low turbulence, and the drag rose rapidly to the usual value somewhere near that of the flat plate with turbulent boundary layer.

Let us now look quite briefly at the nature of the

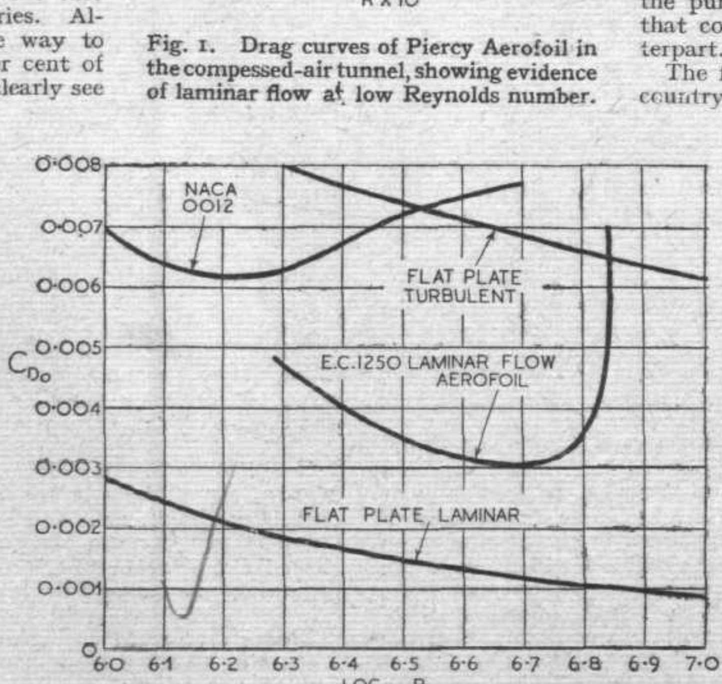
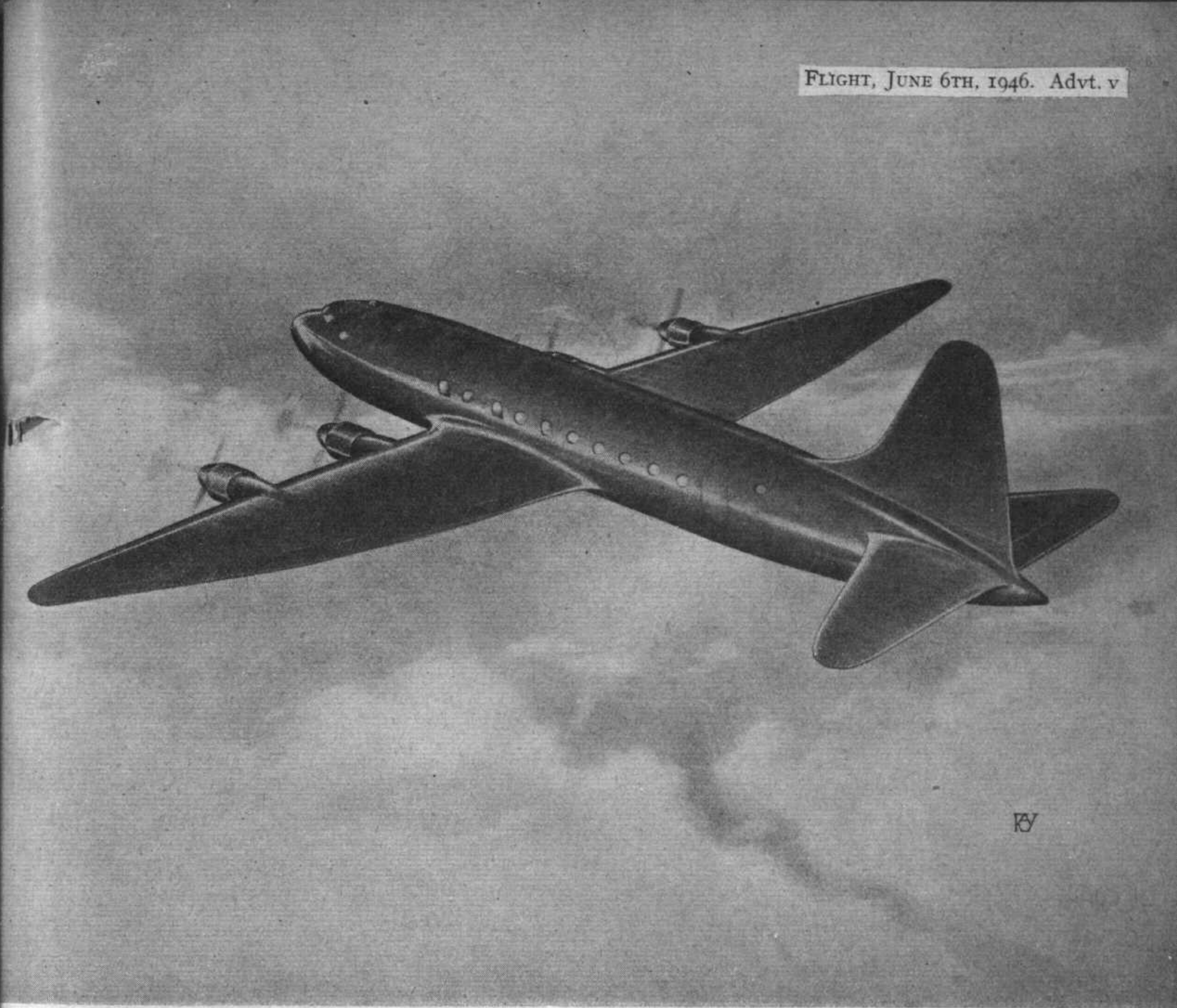
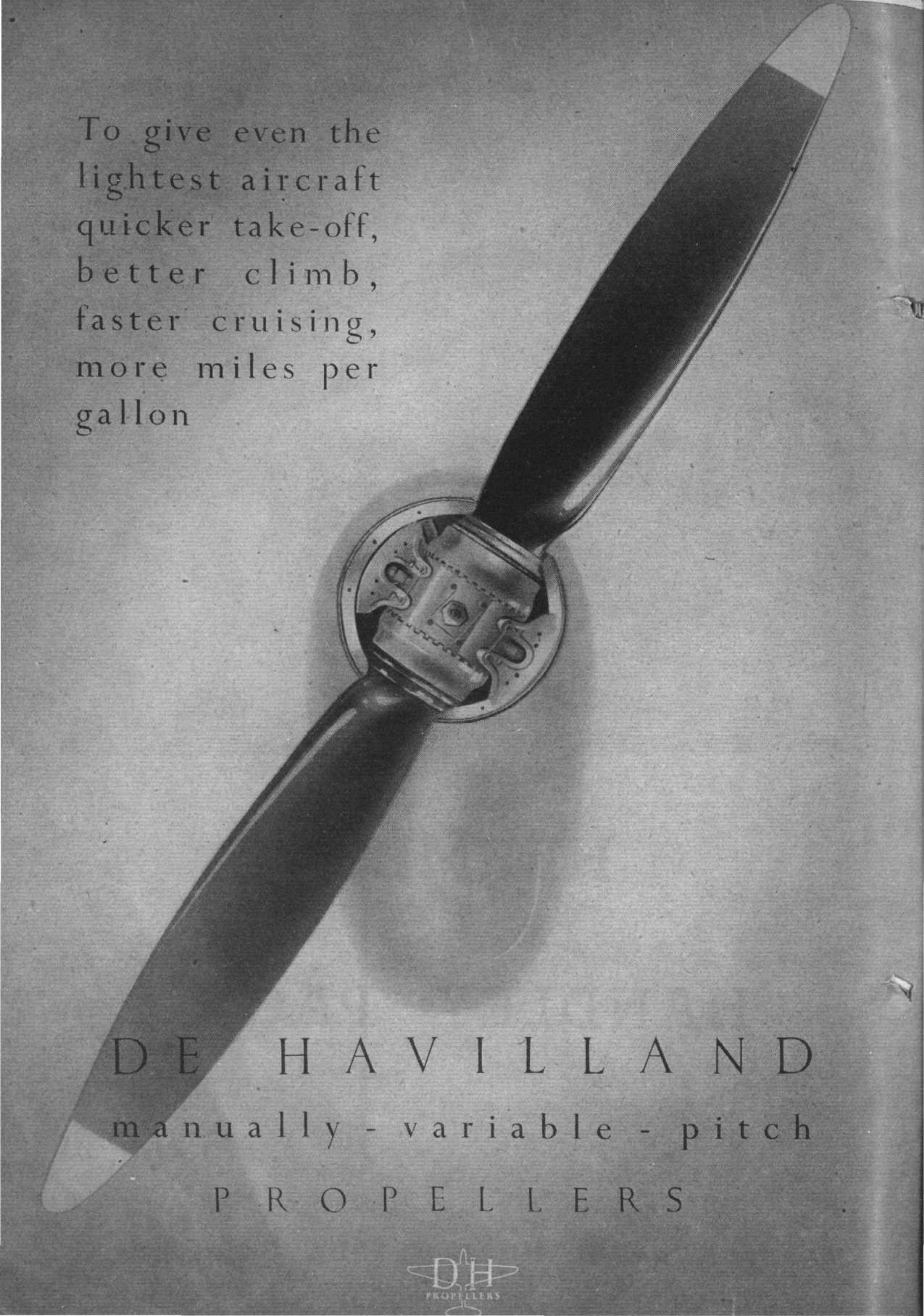


Fig. 2. Test of aerofoil E.C.1250 in the 13ft. x 9ft. N.P.L. tunnel. The first British test giving low drag at fairly high Reynolds number.

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RECENT AERODYNAMIC DEVELOPMENTS

aerodynamic properties of a typical laminar-flow aerofoil. The velocity distribution curves in Fig. 3 show the great difference between the new wings and the older conventional type. These curves relate to the normal operating incidence, say, at cruising speed. The laminar flow aerofoil is designed so that at its most usual lift coefficient there is an equal favourable velocity gradient on the two surfaces.

The effect of departure from this design incidence is indicated in Fig. 4; increase of incidence reduces the favourable gradient on the upper surface and increases it on the lower. Soon the upper surface gradient becomes zero and then

"Conservative" aerofoils up to 20 per cent thickness : chord ratio.

an unfavourable gradient develops near the leading edge, causing transition to move rapidly forward with a consequent increase in drag. Reducing incidence from the optimum design value produces the same sequence of events, but this time on the lower surface. The result is to give a drag curve against lift coefficient, like that depicted in Fig. 5, having a marked depression over a certain range of lift coefficient. Outside this range the drag behaves very much like that of the older aerofoils.

This range of lift over which low drag is attainable is one of the parameters at the disposal of the designer, and it is evidently roughly true that the larger he makes the favourable pressure gradient at the optimum incidence, the wider will be the lift range for low drag. There are, however, limits to the extent of the lift range, and in most practical sections it extends over about 0.3 or 0.4 in lift coefficient. American tests have shown that by use of a hinged flap at the trailing edge the optimum incidence can be considerably varied, and that it is possible, by suitably varying the flap angle, to get the low drag property over a lift coefficient range as wide as from zero to unity.

There is a limitation on the thickness of these new wings. Since the maximum suction now occurs much farther back on the chord than was the case with conventional sections it is evident that the unfavourable pressure gradient on the rear part must have increased, since the pressure at the trailing edge will always be much the same. Hence there is a greater tendency for turbulent boundary layer separation to occur near the trailing edge. The American investigators have described a wing which is free from such separation as "conservative," and have shown experimentally that the greatest thickness-chord ratio permitting such conservatism is a little over 20 per cent.

Another important characteristic is the maximum lift coefficient. Laminar flow wings tend to be more pointed at the leading edge than the older wings and so there is a tendency for the maximum lift to be lower. It has recently been found possible, however, to modify the curvature near the leading edge so that little is lost in maximum lift, without seriously affecting the low-drag behaviour at normal incidence. This result was obtained by an extension of the theoretical method of designing such sections.

The most striking demonstration of the possibilities of these new sections in actual flight comes from a test made at the Royal Aircraft Establishment on a Kingcobra fitted with a "sleeve" of low-drag section at a suitable point on the span. A drag coefficient of 0.0028 at a Reynolds number of 18×10^6 was observed, and so it was proved beyond doubt that the phenomenon was producible under practical conditions.

Such, then, are the broad characteristics of the new wings; why are they not in more common use to-day? There are several answers to this question, but

Permissible height of a contour "wave" found to be not more than one thousandth of its length

by far the most cogent is the fact that such wings are very difficult to construct with the requisite accuracy of contour. A very slight "wave" in the contour is sufficient to produce a local reversal of the pressure gradient and so to cause transition to turbulent flow. Experiment and theory have led to the conclusion that in waves a few inches in length the permissible height of the wave is no more than one thousandth of its length. This imposes an accuracy of construction on the designer of quite a different order from that to which he has been accustomed, and it is not too much to say that the success or failure of the laminar-flow principle depends almost entirely on the discovery of practicable methods of construction that will permit of the necessary accuracy of contour and maintain it under flight loads.

Another practical difficulty is the maintenance of the wing surface in a clean, smooth condition. Very small specks of dust on a laminar-flow wing will upset the boundary layer locally and give rise to a wedge of turbulence behind the speck spreading at an included angle of nearly 20 degrees. Flies caught on the wing during take-off and low flying are particularly troublesome in this respect. It may be necessary to protect the surface by means of a sheet of some thin material that can be torn off when the aircraft has climbed into "clean" air. Water-drops from a rainstorm will also spoil the low-drag behaviour, but this is only a temporary condition and the low drag is restored when the drops evaporate.

These effects of small excrescences have been rendered visible in flight by means of a simple and effective technique devised by W. B. Gray at the R.A.F. He painted the wing with a

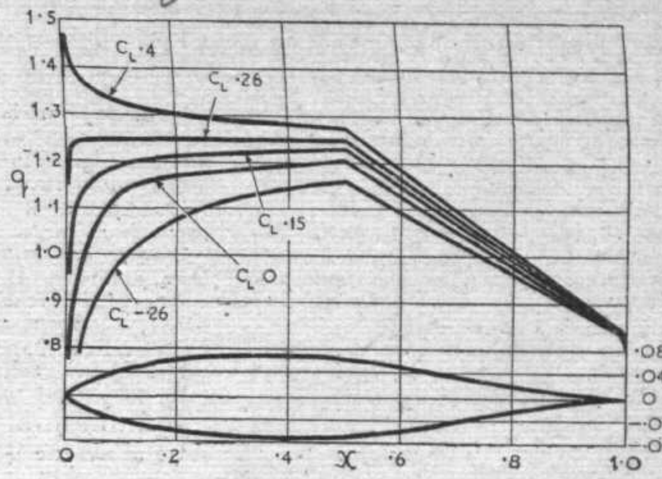

Fig. 4. Section of laminar flow aerofoil with curves showing effect of incidence on velocity distribution.

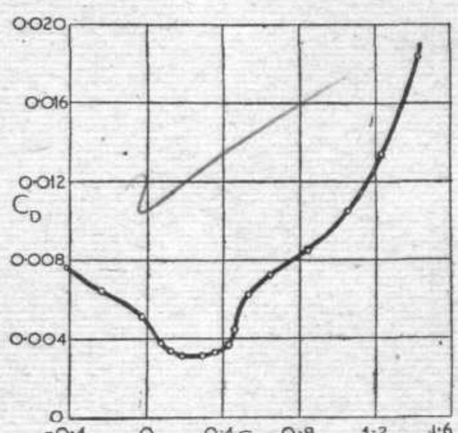

Fig. 5. Drag curve of a laminar flow aerofoil showing limitation of lift coefficient for low drag.

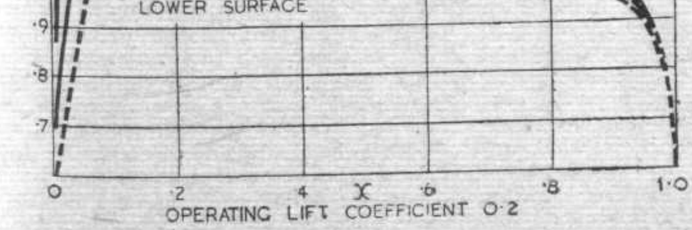

Fig. 3. Curves showing comparison of velocity distribution on a conventional and a laminar flow aerofoil.

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very thin coat of a liquid containing starch and potassium iodide and then flew through a cloud of chlorine produced by introducing this gas into the exhaust of a chimney stack. The chemical action which resulted distinguished clearly between the laminar and turbulent parts of the boundary layer owing to the very different rates of diffusion on those parts.*

An even more effective technique, though only suitable for use in the wind tunnel, has been subsequently developed at the N.P.L. The body to be studied is first sprayed with an emulsion containing china clay, which is allowed to dry, producing a very fine matt white surface. Before an experiment this is sprayed with nitro-benzine, whose refractive index is about the same as that of the china clay particles, with the result that the white appearance completely disappears. When the wind stream is applied the nitro-benzine evaporates most quickly in the turbulent part of the boundary layer, and in a few minutes all the turbulent part has become white again, while the laminar part remains unaffected. An example of the resulting picture is given in Fig. 6. The normal transition is clearly shown

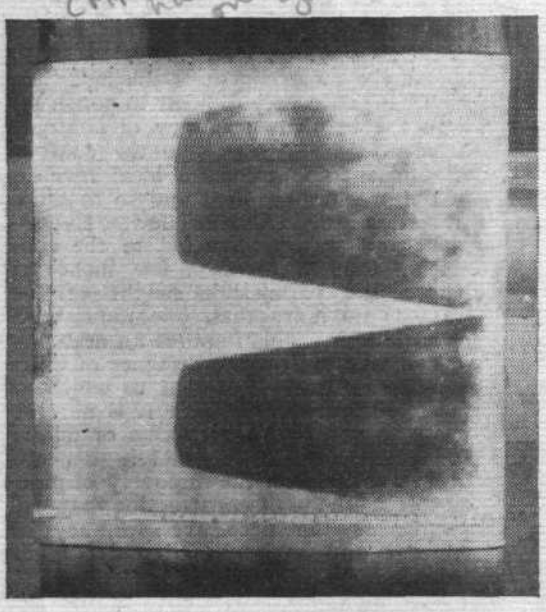


Fig. 6. Transition and turbulence behind an excrescence shown by the "china-clay" technique. Direction of airflow right to left.

by the line of demarcation parallel to the wing span, while a single particle near the leading edge has produced its well-defined wedge of turbulence. This technique is invaluable in wind tunnel work, since it enables one to be sure that results are not being vitiated by unsuspected dust particles.

It may fairly be said, in summarizing the present position on the laminar-flow problem, that the underlying theory is now well understood, that the experimental demonstration of its validity is complete, but that there still remains much to be done before realization in practice becomes sure and certain. Certainty must be achieved before full advantage can be taken of the discovery, since a permanent failure of the laminar regime in the early stages of a flight would involve carrying the same fuel weight as if an ordinary wing had been used.

Similar reasoning can be, and has been, applied to the design of streamline bodies with extensive laminar boundary layers, although, as far as I am aware, the resulting shapes have not yet been subjected to experiment. Like the aerofoils, they tend to have a marked cusp at the rear end. One can hardly help speculating as to whether the faster-swimming fishes have anticipated our discoveries, for they certainly have a form not unlike those which we have calculated!

Designing the wing shape to suit the suction.

Boundary Layer Suction

We now come to a new development in wings which is even more surprising at first sight than the laminar-flow wing, but which has not yet been explored to the same extent. The original idea was due to Dr. A. A. Griffith, F.R.S., who arrived at it when thinking of means of avoiding boundary layer separation in a diffuser. The basic idea is to design a shape for which there is a sudden discontinuity of velocity and pressure at one or more points and to apply boundary layer suction at these points.

The idea of using suction to modify boundary layer flow is a very old one, and hopes have been entertained of replacing turbulent layers by laminar ones in such a way. The fact that suction could prevent turbulent boundary layer *separation* has long been known, and very great increases of maximum lift have been demonstrated experimentally both here and abroad. This use of boundary layer suction has recently been successfully employed in flight by the Armstrong Whitworth Aircraft Company to avoid premature tip stalling on a swept-back wing.

All these older experiments merely applied suction at some point on a wing of conventional form; the new idea started by Dr. Griffith was to *design the shape to suit the suction.* The application of his idea to the design of wings was taken up at the N.P.L. and the extensive mathematical investigations of Dr. Goldstein and his successors previously mentioned, proved of great value in attacking this new problem.

Sections of 40 or 50 per cent t/c ratio with drags similar to those of thin sections.

Let me try to put this basic idea in as simple a form as I can. The diagram in Fig. 7 shows two aerofoil shapes and their theoretical velocity distributions, and for simplicity we will consider symmetrical aerofoils at zero lift. The one on the top is a simple laminar flow aerofoil, while that below it is what we now call, for brevity, a "suction aerofoil." In both cases there is a rising velocity up to a point well back on the chord, but whereas the ordinary aerofoil then exhibits a rapidly falling velocity up to the trailing edge, the suction aerofoil exhibits a large discontinuous fall of velocity followed by a gentle rising velocity from the position of the suction slot to the trailing edge.

The aerofoil shape was in fact obtained by assuming such a velocity distribution and applying the mathematical theory. Griffith's original idea was that as there is now an accelerating flow over the whole aerofoil surface, except just at the suction slot, it might be hoped that the whole boundary layer would remain laminar, with the resulting very low drag. Put in another way, the laminar layer on the front part was largely to be

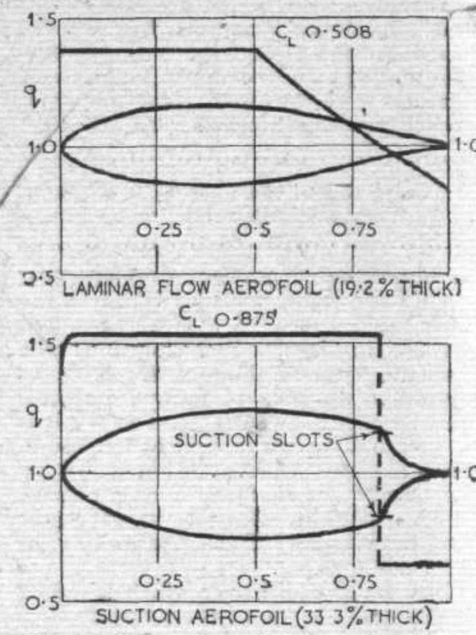


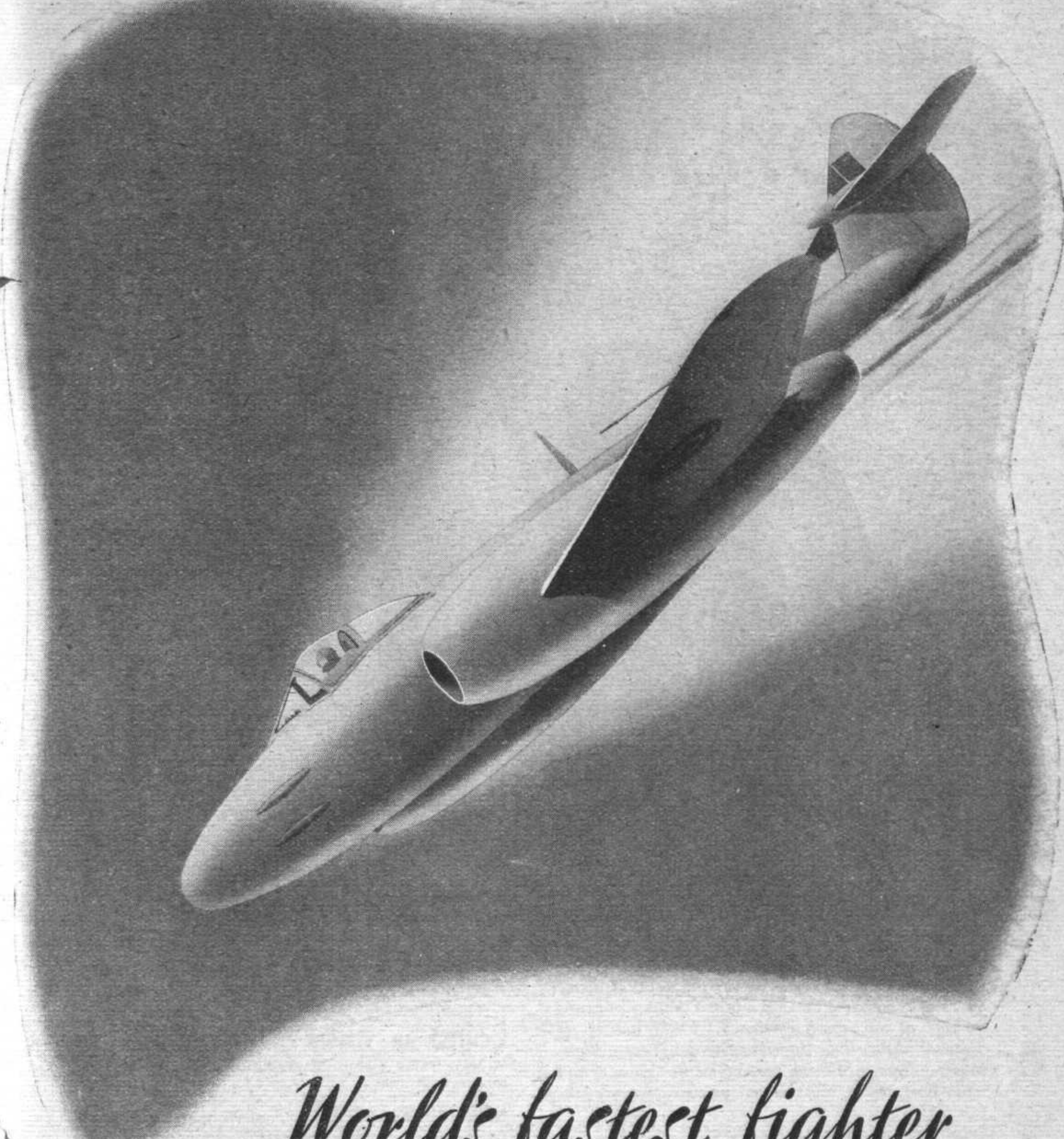
Fig. 7. Comparison of shape and velocity distribution for a laminar flow and a suction aerofoil.

sucked away, and a new layer started at the stagnation point which must occur just behind the slot. Since the velocity gradient is favourable this new boundary layer should remain laminar right to the trailing edge.

A model was made and tested at the N.P.L. The effect of the suction was first observed by attaching fine silk threads to the surface, and it was very interesting to see how those behind the slot, which were almost invisible owing to the violent disturbance there when the suction was not applied, became suddenly steady when the suction reached the requisite amount. The state of the boundary layer was indicated by allowing a fine stream of dense oil smoke to issue from small holes in the model. It was at once noted that the flow on the part behind the slot was only laminar for a very short distance from the slot and then became turbulent.

Various causes for this were suspected, such as vibration of the thin lip of the slot and pulsations from the air-pump, but it soon became evident that none of these was the cause, and that there was something wrong with the assumption that the flow ought to be laminar. It was then remembered that Görther had studied theoretically the flow on concave surfaces and shown the conditions under which laminar flow became unstable on them. His theoretical criterion fitted the N.P.L. experimental observations, and so it became evident that complete laminar flow to the trail-

*See *Flight*, October 11th, 1945—ED.



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ing edge, as envisaged by Griffith, was probably impossible of attainment.

Nevertheless, the suction principle still has great attractions, one of which is that it enables very thick sections to be used without fear of any turbulent separation and probably with a laminar boundary layer up to the slot. It is interesting to note that even if the boundary layer is turbulent from the leading edge, separation near the slot is still prevented by using very little more suction than is needed for a laminar boundary layer. Thus, even forgoing all laminar flow, it becomes possible to make very thick sections, 40 per cent or even 50 per cent thick if need be, with drags of the same order as those of thin sections.

This fact may have a profound in-

Suction instead of moveable surfaces to provide aircraft controls.

fluence on the minimum size of "flying wing" that is a practical proposition from the point of view of internal space. Since in any thick wing the maximum velocity increment near the surface must be high, the critical Mach number is necessarily low, and such wings therefore only have an application to aircraft of moderate speed.

The mathematical theory had to be extended in order to deal with these very thick sections, since all the previous work of Goldstein was based on "thin aerofoil" theory and this approximation was no longer good enough. Lighthill bridged the gap by a new treatment in which he assumed a velocity distribution over the circle of transformation, and from it deduced both the shape and the velocity distribution of the corresponding aerofoil. His treatment is exact and so there are no limitations on account of thickness, but it needs some experience in choosing such a velocity distribution on the circle as will lead to an aerofoil approximating to that required.

A good example of the application of this method is shown in Fig. 8, which depicts an aerofoil 38 per cent thick with a single slot on the upper surface. This aerofoil is now being constructed for test; theory indicates that it should have a lift coefficient range from zero to 2.5 without adverse velocity gradients.

In the few experiments so far made the primary preoccupation has been to discover the best form and width of slot to use and the minimum amount of air that must be sucked away to achieve the desired end. Under good conditions it is only necessary to suck away about half the quantity of air in the boundary layer, but the slot needs to be very narrow and the rather high velocity just inside it may involve considerable internal losses. Moreover, such a very narrow slot might present great difficulties of practical manufacture. With a greater slot width the amount of air that has to be removed increases somewhat, but the lower slot velocities are easier to deal with internally. There is obviously a compromise here, and a great deal more detailed work will be

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needed before the best practical arrangement can be determined.

Another application of the suction principle is to the thin wings which are necessary at very high speeds of flight, including supersonic flight. These wings have of necessity a very poor maximum lift coefficient, little, if any, greater than that of a flat plate; about 0.9 for the plain wing and perhaps 1.3 or 1.4 with a flap. It appears, from theoretical considerations, that the maximum lift coefficient could be increased to a value in the neighbourhood of 2.0 by the use of a suction slot very close to the leading edge. Experimental verification of this prediction has not yet been attempted, but will be shortly. It may well be that the provision of ducts of sufficient size in so thin a wing will prove difficult or even impossible, but if it can be done one of the greatest defects of thin wings will have been overcome.

Once the use of suction is conceded as a practical possibility, there are certain other uses to which it might be put in the endeavour to improve the general aerodynamic characteristics of aircraft. Mention has already been made of its use to prevent tip stalling. Another possibility is its use to prevent incipient flow separation at points such as the junction of wing roots and fuselage in a conventional aircraft. In other words, it may provide an effective alternative to filleting.

A more far-reaching development, which has hitherto been little explored, is the use of suction, instead of moveable surfaces, to provide aircraft controls. It is a little difficult to see how this is to be done at high speeds, but there is a good deal of evidence to suggest that such a scheme might be highly effective at

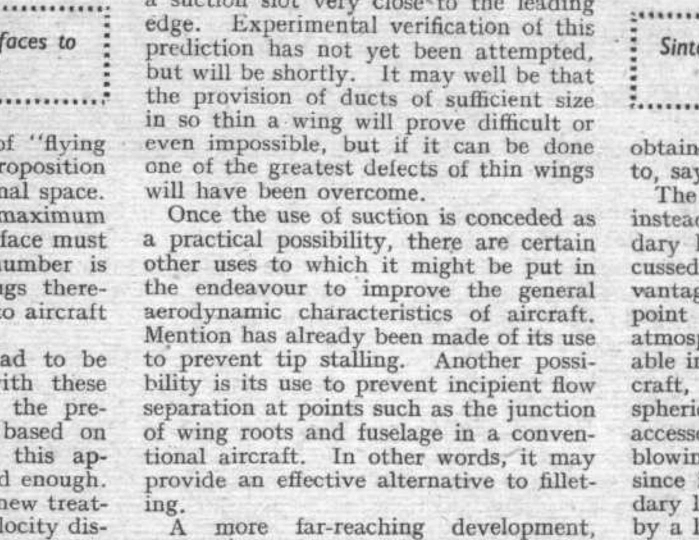


Fig. 8. Thick suction aerofoil with a single slot, CM = O, and a lift co-efficient range from 0 to 2.5.

stalling incidence, which is just where the conventional controls are most troublesome. There appears, in fact, to be a very wide field of possible suction applications, which would well repay an extensive research on broad lines.

In any discussion of this problem an inevitable question arises: what happens if the suction fails? There are two ways of dealing with this: one is to design in such a way that suction failure would not prove catastrophic, the other is to make the probability of failure of the suction plant so small that it is a negligible risk. The former procedure may not prove to be so difficult as might at first be supposed. For example, when the first model of a suction wing was tested at the N.P.L. it was found that quite a reasonable amount of aileron control remained when the suction failed. There was, of course, a complete breakaway of the airflow in the neighbourhood of the slot, but it appeared that the flow rejoined the surface before the trailing edge was reached and so preserved some measure of aileron control. This wing, however, was only 16 per cent in thickness chord ratio, and it may well be doubted if a similar result would be

Sintered bronze perforated surface for suction slots.

obtained if the thickness were increased to, say, 30 per cent.

The efficacy of blowing air from a slot instead of sucking, as a means of boundary layer control, has often been discussed. Blowing has considerable advantages over suction from the practical point of view because pressures *above* atmospheric are generally readily available in the main power plant of the aircraft, whereas pressures *below* atmospheric need additional mechanical accessories. Moreover, a combination of blowing and sucking looks attractive, since it might well enable a dual boundary layer control to be achieved locally by a local pump, and so avoid extensive ducting.

Very little experimental work has so far been done on boundary layer control by blowing air into the layer, and the problem is not nearly so amenable to theoretical treatment as the corresponding suction problem. Such experiments as have been made are disappointing and suggest that to achieve similar results a blowing device needs several times as much air as is needed with suction. It would, however, be a mistake to dismiss blowing as impracticable in the present state of knowledge. The mere fact that the necessary pressure might in some cases be forthcoming from "ram" effect, with small losses and without any additional mechanism, may well offset the lesser "volume efficiency" of the process.

Recently a still further means of suction control of the boundary layer has been under consideration at the N.P.L. This involves the use of distributed suction acting through a porous surface in place of local suction at one or more slots. Again the idea is not new, the possibility of using perforated surfaces having been suggested many times in the past. What is new is the production of a porous material in the form of a sintered bronze which has interstices of extremely small size and very closely spaced. Dr. Preston has been considering this boundary layer problem from the theoretical aspect, and is convinced that it holds out great promise. He is preparing to put his ideas to the test of experiment.

Britain's Test Pilots

No. 10

JEFFREY K. QUILL, O.B.E., A.F.C.,

CHIEF TEST PILOT OF SUPERMARINE DIVISION OF VICKERS-ARMSTRONG, LTD.

"Flight" photograph

JEFFREY QUILL'S name is synonymous with the development of the Spitfire, to which he has devoted most of his waking hours for the past eight years. He can quote in everlasting and intricate detail mark numbers and slight differences in the beloved "Spit," as it has continually improved during the war years and kept one jump ahead of the *Luftwaffe*. In this respect some of his figures are interesting. The Spitfire prototype had a maximum speed of 349 m.p.h., and the Mark 24 does 452 m.p.h. Service ceiling has risen by nearly 10,000 ft and the rate of climb just doubled from 2,500 ft per min. In all-up weight the Spit. 24 is the equivalent of the original prototype carrying 31 passengers, each of 170 lb—a greater load than the Viking carries—and, thanks to Rolls-Royce, the power has also increased by 100 per cent.

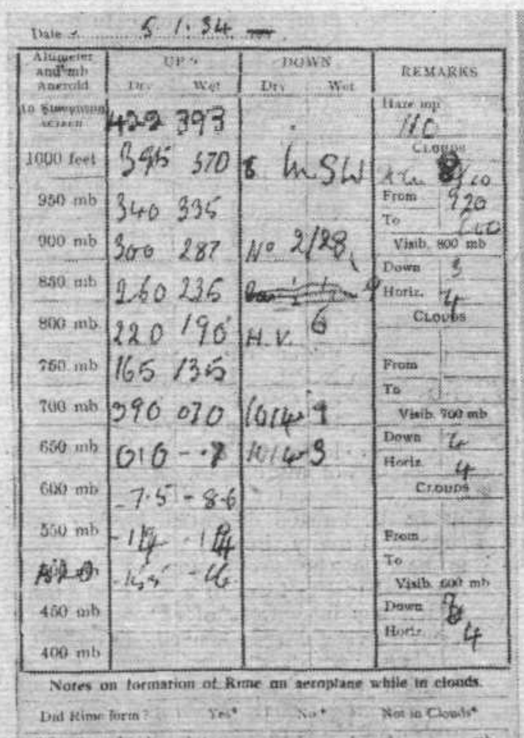
Quill took a short service commission in the R.A.F. in 1931 and learnt to fly on Avro Tutors at No. 3 F.T.S. at Grantham. In the service flight of the school he flew Siddeley Siskins and was graded as "exceptional" on passing-out in August, 1932.

For a while he was posted to No. 17 Fighter Squadron at Upavon, which was one of the first squadrons to be equipped with the then famous Bristol Bulldog—a fighter which was later to be adopted by over 10 countries. While with No. 17 in 1933 he was one of the team to demonstrate the converging bombing attack at the R.A.F. Display of that year—the only R.A.F. Display ever held in really bad weather.

With the "Met." Flight

Posted to Duxford in December, 1933, Quill spent the next two years doing a wonderful flying job in the Met. Flight. With Ken. Stoddard and Dick Reynell (later a test pilot in the Hawker Group and unfortunately killed while back with his old squadron for a while during the Battle of Britain), he tried to complete a whole year's meteorological flights without missing a day. He succeeded. This did not include Sundays. Apparently Sunday weather did not matter in those days, as no flights were scheduled to take place.

Siskins and Gauntlets were mostly used, although the Westland Wallace and Hawker Fury took some part. At 7 a.m. and 1 p.m. each day, whatever the weather, fog or sunshine, an aircraft climbed to approximately 30,000 ft, taking meteorological readings all the way up. Oxygen was carried but, of course, there was no artificial horizon



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1000 feet	345	370	6 lm SW		Clouds 8/10
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650 mb	010	-·7	1014	3	Down 4; Horiz. 4
600 mb	-7·5	-8·6			Clouds
550 mb	-14	-14			From; To
[illegible]	-15	-16			Visib. 600 mb
450 mb					Down 8; Horiz. 4
400 mb					

Notes on formation of Rime on aeroplane while in clouds.

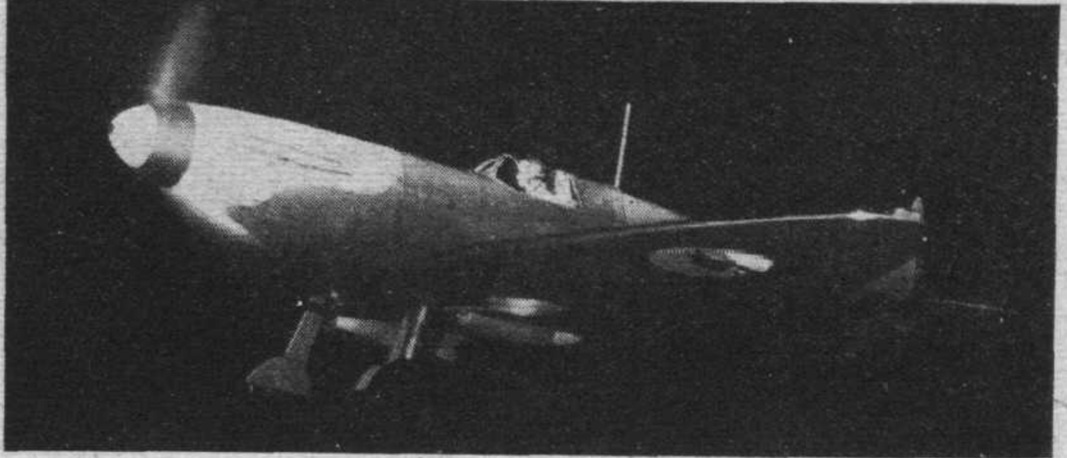
Did Rime form? Yes* No* Not in Clouds*

Rime formed in layer between mb. and mb

"Flight" photograph

WEATHER OR NOT: A Gloster Gauntlet (Bristol 600 h.p. Mercury engine) of the type used by the Meteorological Flight. Although wheel spats were fitted by the manufacturers it was usual to remove them because of trouble with mud. On the left is one of Jeffrey Quill's own climb reports from January, 1934. It will be seen that the climb is registered in millibars. The highest point reached —520 m.b.—equals about 30,000 ft.

BRITAIN'S TEST PILOTS



"Flight" photograph.

IN THE CHANCELIGHT: Quill about to take the Spitfire off for its first night flight on January 20th, 1938, at Eastleigh airfield, near Southampton.

nor radio, neither was there a sensitive altimeter to help when flying up or down through fog. The only blind-flying aids the dashboard carried were a Reid and Sigrist turn and bank indicator and an inclinometer.

In bad weather, 15 per cent of the flights ended as "engine-on" forced landings, and the Siskin undercarriage was found to be man enough to be able to stand landing on or take-off from harrowed land. Time entered into this work in that the report had to be at the Air Ministry by definite times of the day. On a number of occasions Quill landed by an A.A. roadside telephone box to ring-up the familiar Holborn 3434 by the prescribed time.

A very long sequence of 100 per cent regularity was broken by peculiar circumstances. Quill had forced-landed at Hatfield and rang Reynell to tell him to go on leave as he (Quill) would do the climb on his way back to Duxford. Reynell having left the station on leave, Quill found the Siskin's Jaguar engine wouldn't start in time for the flight to be made that day.

Martlesham and Vickers

After putting up such a good show at Duxford, he was posted to Martlesham Heath as an embryo test pilot, and it was here that he met "Mutt" Summers of Vickers, who was on the lookout for exceptional young pilots. Although he was offered a permanent commission in the R.A.F., he left the Service and on January 6th, 1936, joined Vickers at Brooklands. There was a tremendous lot of development work going on at the time, but Quill concentrated mostly on flying the Venom and Spitfire. In fact, he considers putting down the Venom across Gosport airfield one of his best jobs of work.

I remember one very dark and wet night on Eastleigh airfield in January, 1938, watching Quill make the first night-flight on a Spitfire. The then new ejector exhaust stubs had been fitted, and the burbling flames which shot out from these as he closed the throttle to land made him utterly blind insofar as seeing anything ahead was concerned. He landed almost by instinct, and fortunately all was well, but the incident might have had unpleasant results.

In common with a number of test pilots, Quill lent the fighter boys a hand during the Battle of Britain. He served for a month as a flying officer with No. 65 Spitfire Squadron. Very unconvincingly he declares that it was "really for ops. experience and just happened to coincide with that phase of the war." He couldn't take the latest thing in Spits with him, but had to put up with a Mark I with limited-pitch, constant-speed, airscrew. Nevertheless he managed to get three Me 109s to his credit in the time.

In November, 1943, he started a lot of hard work which was called a rest. He was given a commission as a lieutenant commander in the Fleet Air Arm for five months. After a deck-landing course at Easthaven, he went to *H.M.S. Ravager*, a training carrier, for a while. His next ship was *H.M.S. Attacker*, which had two Seafire Squadrons, Nos. 879 and 886, on board. He flew with both squadrons until he went to No. 1837 Squadron, which was shore-based. No. 1837 had Vought Corsairs. This so-called rest really developed into a study of the technique of landing high-performance aircraft on carrier decks, and by the time he returned to Supermarines, he knew the problem very thoroughly, having deck-landed all the British and American carrier types with the exception of the Fairey Firefly.

Back as a test pilot once more, he carried on the intensive development of the Spitfire in all its forms, the Seafire and the Spiteful. In this he was assisted by a splendid team which included Don Robertson, Frank Furlong (who had been in charge for the five months he was away and who was unfortunately killed in a Spiteful prototype), and George Snary, who was at one time in the Met. Flight with Quill.

As is customary among pilots, Quill does not consider that his test flying has been anything but uneventful. He admits, however, to putting a Wellesley into a spin by mistake and having to bale out. He also claims the record for going backward in a Spitfire 21. Having made a belly landing at Worthy Down, the Spit flicked completely round and shot off backwards at some 70 m.p.h. It might have been 75 m.p.h., but airspeed indicators are so unreliable in reverse.

Apart from these items, he agrees there have been a few engine-off landings and undercarriage jams, but if memory serves, there was also a slight affair when he was doing some spinning tests on a prototype Seafire XV in 1944. The aircraft recovered satisfactorily from a spin in one direction but refused to recover, with its hook-limited rudder surface, from one in the other direction. He duly released the tail parachute, but this unfortunately opened on the side on which full spin recovery rudder was being held. The parachute lines jerked the rudder back to the central position and broke a bone in his ankle. The spin was checked, however, and it was only after landing and leaving the aircraft that Quill realized that the incident had done his ankle no good at all.

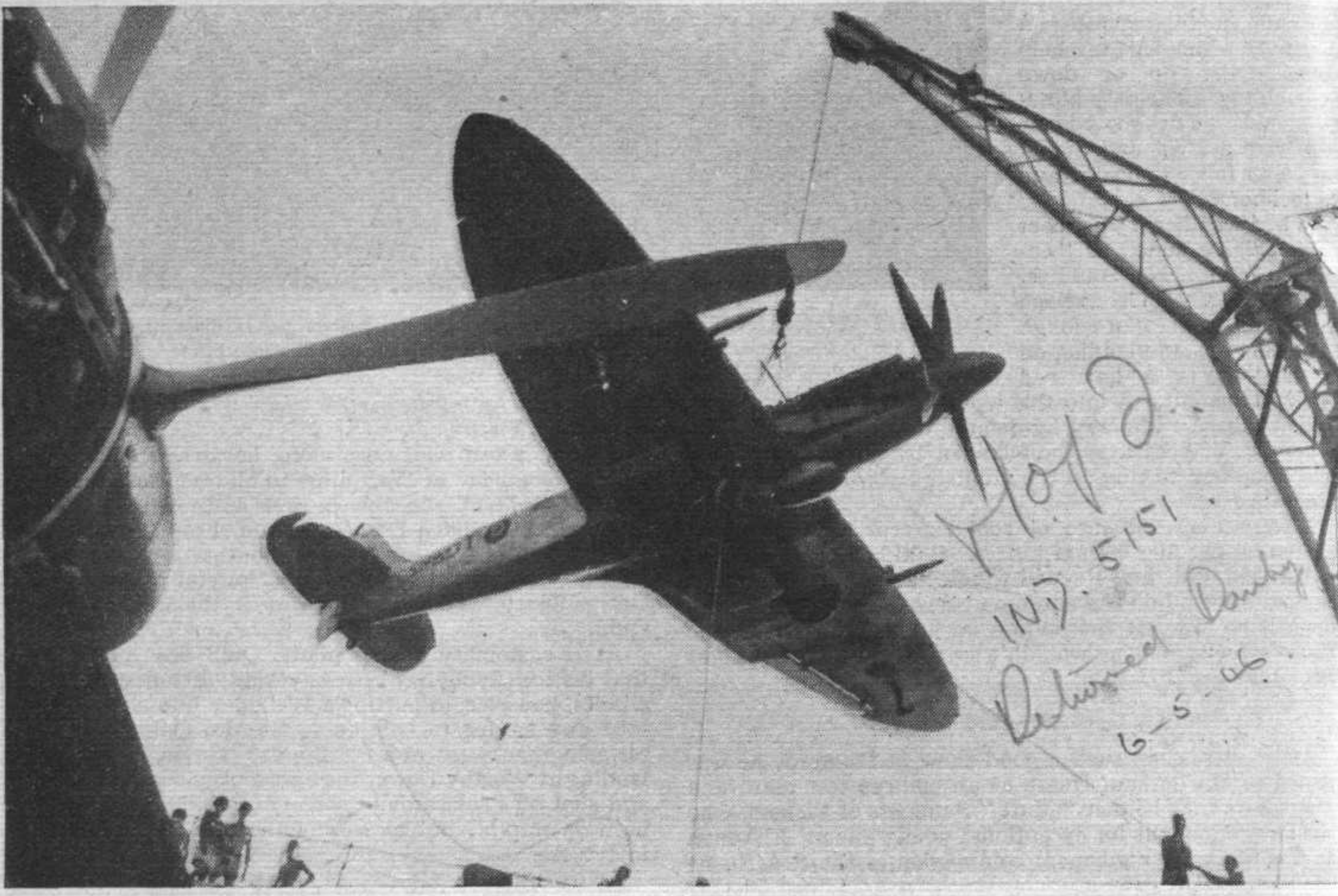
Of all the many types of Spitfire he had flown, he considers the floatplane version the most pleasant to fly and "Dumbo," the Supermarine 322 with variable-incidence wing, the most interesting aircraft to test.

Jeffrey Quill is now 33 years of age, and has 4,500 flying hours to his credit on 90 different aircraft types. J. Y.

FORTHCOMING EVENTS

June 9th. — United Services Flying Club "House Warming" at Elstree.
June 10th.—Luton Flying Club Air Rally, Luton Airfield.
June 15th.—Old Cranwellian Assoc. reunion, R.A.F. College.
June 15th.—No. 150 Sqn. R.A.F. reunion dinner, Dorchester Hotel, 6.30 p.m.
June 17th.—The Royal Society's Empire Scientific Conference opened by the King in London University, 11 a.m.
June 19th.—Sir Frederick Handley Page at Gauge and Tool Makers' Assoc. luncheon, Savoy, 12.30 p.m.
June 22nd.—Air Pageant, Southampton Airport.
June 30th.—Northern Heights M.F.C. Gala Day, Langley Airfield, Nr. Slough.

SERVICE AVIATION



INSTRUMENT OF OCCUPATION: No. 4 Squadron of the Royal Indian Air Force sailed recently to Japan aboard the carrier *Vengeance*, to join the British Commonwealth Occupation Forces. The picture above shows a Spitfire XIV being lowered on to the flight deck of the carrier.

Royal Air Force and Naval Air Arm News and Announcements

Air Staff Post Discontinued

IT is announced by the Air Ministry that the Air Staff is being reduced and partially reorganized, as part of the policy of contracting the wartime strength of the Air Force.

In the course of these reductions, the post of Deputy-Chief of the Air Staff was discontinued on June 1st; Air Marshal A. Durston, C.B., A.F.C., last Deputy C.A.S., passes to the retired list.

Demobilization

THE advance programme of R.A.F. and W.A.A.F. releases for July and August states that the general level of release for ground airmen will be Group 40. The average release group of airwomen is given as 48. Aircrew, both officers and airmen, will be released up to and including Group 46.

R.A.F. ground officers and W.A.A.F. officers will be released at Groups 39 and 47 respectively, although, as usual, variations remain due to shortages in certain branches.

American Decoration

WING CDR. R. P. BEAMONT, D.S.O., D.F.C., last week received the American D.F.C. Wing Cdr. Beamont, who was captured on the Continent in 1944, led the top-scoring Tempest Wing against the flying bombs.

R.A.F. Pay-Groups Concentrated

TAKING effect from the same date as the new pay rates (July 1st), a new system of trade grouping has been announced. The present six groups will be condensed into four—A, B, C, and D.

As a general rule all trades in Group I will be transferred to Group A, with the exceptions of Moulder, Pattern Maker and Turner, which will be in Group B. The initial rate of pay, after training, for Group A is to be 45s 6d weekly.

All existing trades in Group II will transfer to Group B, except that of R/T Operator, which will be in Group C. Pay rate of Group B is to be 42s.

Group C will consist of all trades in Group III except Motor Boat Crew (to be classed under Group D), all trades in Group IV, and the following in Group V—Driver M.T., Musician, P.T. Instructor, Parachute Training Instructor and R.A.F. Police. The rate of pay for Group C will be 38s 6d.

The trades in Group V are to come under Group D, with the exception of the five trades in Group C mentioned above. Group D will receive 35s weekly.

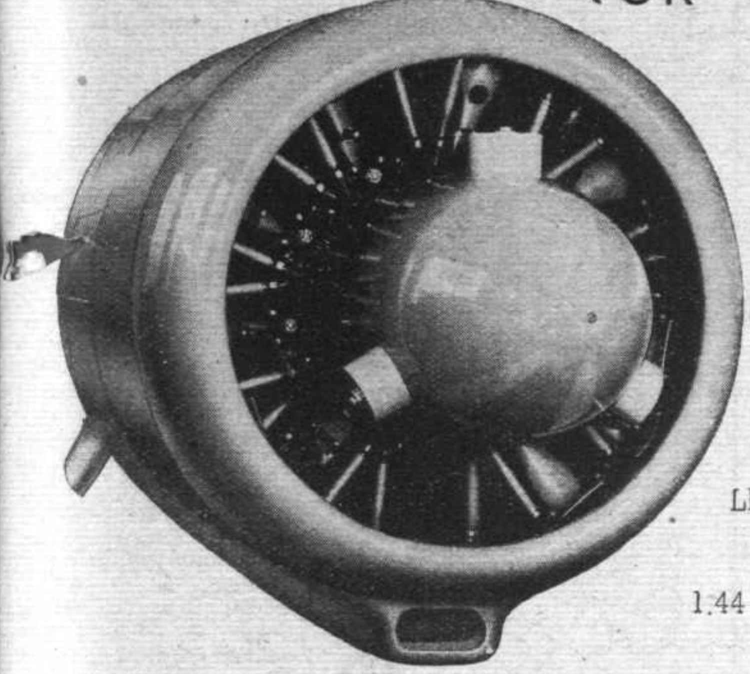
The Medical and Dental trades are to be divided between Groups B and C as follows: the trades of Dental Mechanic, Dispenser, Laboratory Assistant, Masseur, Mental Nursing Orderly, Operating Room Assistant, Radiographer, Special Treatment Orderly and Trained Nurse will come under Group B, and those of Chiropodist, Dental Clerk Orderly, Nursing Orderly, Optician Orderly and Sanitary Assistant are to come under Group C.

Grouping of the trades of Gunner and P.A.C. Operator will be notified later.

R.A.F. Living Conditions Improved

WHEN the current plans to improve living conditions in the R.A.F. are completed—and their scope may be gauged by the fact that it is proposed to spend £2,000,000 on the job in the present financial year—life in the Service should be so pleasant that retired "Blimps" with 1914 ribbons will probably snort with contempt at its (alleged) softness, as they have done, of course, at each succeeding improvement in the lot of the serving man. But while it is true that the good sailor,

LEONIDES THE 500 H.P. POWER PLANT FOR THE SMALL TRANSPORT AND MEDIUM TRAINER



Airframe designers should know the outstanding features of the 500 h.p. ALVIS LEONIDES TYPE LE.1.M. and LE.2M. . . . HIGHER POWER for LOWER WEIGHT, 1.44 lbs. per B.H.P. bare and 2.23 lbs. per B.H.P. as a complete power plant . . . Really adequate COOLING with LOW DRAG—Pressure Baffling and Controllable Gills . . . 9 CYLINDERS giving smoother torque and smaller diameter, 42" . . . Take-off boost is available up to 4,000 ft. giving POWER IN EXCESS of sea level rating for take-off from high altitude airfields . . . Two reduction gear ratios, 0.5 or 0.625 . . . Equipped for Constant speed, Feathering and Braking Propellers . . . Air intake system incorporating ice guard, oil-heated throttles and throttle body, momentum and filter air-cleaning . . . PETROL INJECTION SYSTEM . . . A 340 B.H.P. weak cruising power maintained to 11,000 ft. . . . Low piston speed at max. R.P.M. 2205 ft./min. . . . Available for drive with a SEPARATE ACCESSORY GEARBOX if required . . . Please write for further information, or an ALVIS engineer can call and discuss with you fully the LEONIDES TYPE LE.1.M. or LE.2.M. POWER PLANTS . . . . . .

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SERVICE AVIATION

soldier, or airman can cope cheerfully with hard and uncomfortable living conditions when necessary, it is a mistaken idea that discomfort is needed to make him tough and efficient; the new move is as sound in policy as it will be welcome to the officers and other ranks of the regular R.A.F. in peacetime.

The basis of the whole project is expressed in the official statement that "the aim of the domestic building programme for the peacetime R.A.F. is to provide conditions and amenities for its skilled personnel fully equivalent to what they might expect to enjoy if employed in civil industry," and the sum mentioned above is to be divided equally between improving the standard of accommodation on about 80 existing stations in this country, and on building additional married quarters.

The first step in the programme will be to improve conditions at temporary stations which are being retained and at pre-war stations which were extended. This will include such things as the provision of hot and cold showers and where Nissen huts must be retained for the time being reducing the number of tenants from 18 to nine and giving them warmer floor coverings and more furniture. Gradually, however, temporary stations will be rebuilt with permanent accommodation designed to avoid as far as possible the old "regimental" atmosphere; the airman will have personal privacy in his living quarters similar to that of normal civil life and dining halls will be on restaurant lines with cafeteria service.

Eventually every station is to have a complete recreational centre with cinema, swimming bath, gymnasium and similar amenities open not only to the men but also to their families, but it is hoped to make a start this year on the provision of well-designed clubs with bar lounges, billiards, table tennis, and reading rooms, where airmen may entertain guests of both sexes.

For the married airman life will be even more "civilized" by the provision of semi-detached houses instead of the old type of "married quarters" built in terraces, and, in view of the general housing shortage, 25 per cent of the new accommodation will be reserved for the families of men serving overseas. In the meantime the 6,500 married quarters which were commandeered for other uses during the war are being steadily reconverted, decorated and refurnished so that an increasing number of men may be living with their families close to their stations.

The full programme will necessarily be spread over a number of years, and the rate of progress will depend on the availability of materials and labour, but it is hoped, for example, to get well under way with 1,000 of the new "semi-detached" married quarters during the current financial year, spread over some 15 or more stations in this country.

When this attractive programme is completed one may surely expect the once familiar "Join the R.A.F. and see the world" to give place to "Join the R.A.F. and live in comfort."

Roll of Honour

Casualty Communiqué No. 585.

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

Royal Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. L. Berry; Flt. Sgt. J. D. M. Duncan; Sgt. C. Edwards; Flt. Lt. R. V. Hearn, D.F.C.; Flt. Sgt. O. G. Jones; Sgt. R. C. Rayment; P/O. A. Steainstreet; Sgt. R. Surtees; F/O. L. S. Trail.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. E. Ainsworth, F/O. F. W. Bailey; Flt. Lt. M. A. L. Balasse; Sgt. P. Banks; Sgt. G. E. Barsby; P/O. W. E. H. Barty; Sgt. V. D. Basso; P/O. J. Baxter; Sgt. J. C. Bayton; Sgt. D. C. Berrisford; Flt. Sgt. A. Berry; P/O. F. G. S. Best; Flt. Sgt. R. C. Bidwell; P/O. S. Birch; Flt. Sgt. A. F. Birdseye; Sgt L. G. Blatchford; Flt. Lt. G. D. Body; Sgt. P. F. Bolderstone, D.F.M.; F/O. R. C. Booth; W/O. J. J. Bonfield; F/O. A. M. Bonney; Sgt. M. Brennan; Flt. Sgt. E. D. Brick; W/O. J. K. Brill; Sgt. G. Brogden; F/O. J. P. Brooksbank; Flt. Sgt. S. A. Brown; Flt. Sgt. T. A. V. Brown; Flt. Sgt. T. Brumfitt; Flt. Lt. D. S. Buckie; Act. Flt. Lt. J. H. Burrough; Flt. Sgt. U B. Butters; F/O. A. B. Campbell; Act. Flt. Lt. L. N. B. Cann, D.F.C.; Sgt. T. E. Carr; Flt. Lt. C. B. Carter, D.F.C., D.F.M.; Sgt. L. V. Chandler; Sgt. I. R. Clapton; Sgt. V. J. Clark; P/O. R. J. Clarke; Sgt. B. Coleman; Sgt J. Constant; Sgt. L. J. Cooke; Flt. Sgt. J. Cooling; Flt. Sgt. A. D. Cozens; Flt. Sgt. W. E. Crane; Flt. Sgt. T. Cronan; Flt. Sgt. R. W. Crook; Flt. Sgt. C. W. Cross; Sgt. E. A. Cross; Flt. Sgt. C. C. Crux; F/O. P. J. Cuff; Sgt. G. A. Dalton; Flt. Sgt. S. Darroch; Sgt. R. M. Davies; Sgt. R. E. B. Day; Flt. Lt. G. S. Devereau; P/O. P. L Dooley; Flt. Sgt. J. Dunn; W/O. F. A. Easthope; Flt. Sgt. S. Easton; Flt. Sgt. S. Eccleston; Sgt. R. Eke; Sgt. J. F. W. Emerson; Flt. Sgt. J. A. Etheridge; Flt. Sgt. D. W. Evans; F/O. A. C. Everett, D.F.M.; Sgt. F. G. Fisher; P/O. R. V. Fisher, D.F.M.; P/O. J. Fletcher; Sgt. J. L. Forrester; Flt. Lt. D. J. Foster; F/O. L. M. Freedman; Sgt. G. A. C. Frizzell; Flt. Lt. R. W. Gillham; F/O. H. C. Godfrey; Sgt. S. Goodier; Sgt. P. E. Green; F/O. R T. Greig; F/O. O. Griffiths; Sgt. E. H. Grundy; F/O. T. R. Hain; Sgt. E. G. Hall; Flt. Sgt. A. Hampshire; Sgt. [illegible] Hanks; F/O. T. A Hannant; F/O. J. E. C. Hardy; Sqn. Ldr. K. G. Hart, D.F.C.; Sgt. L. [illegible] Hart; Act. Flt. Lt. N. V. Haynes; Sgt. P. O. Haynes; Sgt. A. Heckingbottom; F/O. J. W. Hennessy; F/O. A. Henshaw; Sgt. J. J. V. Higgins; Flt. Sgt. H. R. Hillier; Sgt J. H. Hinton; Sgt. J. H. Hipwell; Flt. Sgt. J. S. Hogg; F/O. J. A. Hollingworth; Flt. Sgt. W. Horlor; Flt. Sgt. J. S. Hoskins; W/O. J. W. Howie; W/O. T Hughes Flt. Sgt. W. P. Hughes; W/O. A. Hundley; W/O. T. F. Hunter; Sgt. L. J. H. Hutchinson; Sgt. R. E. Ives; F/O. T. C. James; Sgt. A. J. Jeffery; Sgt. W. J. R. Jeffree; Flt. Sgt. R. H. Jenkins; F/O. B. Job; Sgt. D. R. Jones; Sgt. J. Jones; Sgt. K. Jones; Sgt. E. T. J. Keay; Flt. Lt. J. Kennedy; P/O. K. I. Kernahan; Sgt. K. D. Kibbey; F/O. J. Kirkpatrick, D.F.C.; P/O. H. L. Knowles; Flt. Sgt. A. Lee; Sgt. T. Leeming; F/O. B. D. Lilley; Flt. Sgt. D. J. Lincoln; Sgt. G. Lindsay; F/O. R. London; W/O. J. Lyons; Sgt. J. McCauley; F/O. P. F. McDonald; Sgt. T. D. McGill; Flt. Lt. R. H. McGowan; Sgt. J. G. McIlveneye; Sgt. R. S. McKillop; Flt. Sgt. P. D. Mann; Sgt. H. S. Martin; Flt. Sgt. J. W. Massey; Sgt. H. Mawson; Flt. Sgt. N. H. Mayoy; Sgt. S. A. Meadows; W/O. M. C. Medcalf; F/O. J. Middleton; Flt. Sgt. C. E. Miller; Act. F/O. K. A. W. Miller; Sgt. K. S. M. Miller; Sgt. G. E. Mills; F/O. L. Milner; Sgt. T. Moffat; F/O. D. J. Mole; Sgt. H. Monks; P/O. S. Moore; F/O. J. D. Morgan; Sgt. A. J. Morley; P/O. R. H. Morris; Flt. Sgt. J. M. Murray; F/O. A. H. Nicholls; Flt. Sgt. C. A. P. Noble; Sgt. R. G. Nuttall; Group Capt. P. B. B Ogilvie, D.S.O., D.F.C.; Flt. Sgt. J. Orman; Flt. Sgt. R. Oswald; Sgt. R. G. Pain; Flt. Lt. J. Paton; Flt. Sgt. F. E. Peet; Sgt. A. E. Perry; Sgt. B. H. Petch; F/O. R. A. Pitts; Flt. Sgt. J. Potts; Sgt. T. I. Powis; Sgt. T. A. Purvis; P/O. T. D. S. Rabbitts; Flt. Sgt. A. R. Rayner; Flt. Lt. T. W. Reynolds; Act. F/O. W. Riddell; Sgt. R. D. Roberts; Sgt. D. E. Rodda; F/O. F. W. Rolls; F/O. R. E. Rudling; Sgt. J. D. Rushworth; Sgt. P. C. Russell; Sgt. K. R. Salton; P/O. L. D. Sampson; F/O. C. Saunders; Sgt. H. Sansome; Sgt. J. Scott; Sgt. T. Scott; F/O. E. J. Seager; F/O. S. H. Sharpe; Flt. Sgt. C. Shaw, D.F.M.; Flt. Sgt. M. J. Simonds; Sgt. R. J. Sims; Sgt. A. F. Skelton; Sgt. F. P. J. Smith; Sgt. J. H. Smith; Sgt. W. Snowden; Sgt. H. Stanton; Flt. Sgt. C. W. Stogdale; Act. Flt. Lt. G. S. Stout, D.F.C.; Flt. Sgt. A. Sutcliffe, D.F.M.; W/O. J. R. Sutton; Flt. Lt. J. A. Swanson; Sgt. G. Swift; Flt. Sgt. P. Taylor; Sgt. R. T. Taylor; Sgt. E. Thomas; Sgt. G. H. Tilburn; Sgt. P. V. Tiran; Flt. Sgt. E. G. Towle; W/O. R. D. Toynton; Flt. Sgt. S. C. Trevis; Flt. Sgt. F. Truman; F/O. E. A. Turner; F/O. J. A. E. Veglio; Sgt. G. E. Vernon; F/O. R. F. Vidler; F/O. J. H. Waldron; Sgt. T. C. Walker; Flt. Sgt. J. H. Walter; Sgt. T. M. Ward; P/O. T. N. Watson; Sgt. L. J. Weekes; F/O. G. R. E. Weir; Sgt. A. West; Flt. Sgt. A J. Weston; W/O. G. H. Wheatcroft; Sgt. A. R. Whiffin; Flt. Lt. H. C. L. White; Sgt. L. White; P/O. G. Williams; Flt. Sgt. J. S. Winter; F/O. B. J. Wisby; F/O. W. H. Witherden; Sgt. J. L. Wood; Flt. Sgt. G. D. Wright; Flt. Sgt. S. J. Wright; Flt. Sgt. T. L. Wright; Sgt. R. D. B. Younger.

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

KILLED ON ACTIVE SERVICE.—Cpl. A. Ardern; A/C.1 T. B. Bowen; Wing Cdr. R. A. Chignell; A/C.1 J. H. Dolman; F/O. J. G. Hanson; A/C.1 W. E. Morrill; Cpl. D. H. Sumner.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE—W/O. G. R. Allbut; Flt. Sgt. J. W. Brookes; Sgt. J. W. Burns; Sgt. R. H. Franks; P/O. J. B. MacDonald;; Flt. Lt. J. Neilson; Flt. Sgt. K. G. Parker; F/O. J. H. Swinbanks.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Lt. G. H.

C.A.S. HONOURED: On May 28th Marshal of the Royal Air Force Lord Tedder drove through the City streets in an open carriage to the Guildhall, where he received the Freedom of the City of London. Members of the A.T.C. formed a guard of honour.

SERVICE AVIATION

Ellis; Act. Flt. Lt. R. F. Marrack; Sgt. W. P. Reidy.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. A. Blanchard; Sgt. E. C. Charles; Flt. Lt. G. W. Green; F/O. H. H. S. Gwyer; Sgt. R. W. Henson; Sgt. J. A. Rudd; Sgt. H. Stobart; L.A/C. J. Webdale.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. P. E. Sibeth.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. R. A. M. Stradling.

DIED ON ACTIVE SERVICE.—L.A/C. T. E. Arridge; A/C.1 R. J. Bourne; L.A/C. W. R. Bullivant; L.A/C. S. P. Burge; Sgt. C. R. F. Burnett; Sgt. G. H. Bryan; Sgt. R. Cochrane; A/C.1 C. H. Cook; F/O. R. N. Cooper; Cpl. J. C. Garnett; L.A/C. D. H. Grant; Cpl. L. Harnett; L.A/C. P. Hatfield; L.A/C. A. H. Heaver; Cpl. R. W. Hodginson; L.A/C. A. J. Jaggard; L.A/C. J. G. Jardine; Flt. Sgt. D. J. Jarvis; L.A/C. E. N. Jarvis; L.A/C. J. Johnston; L.A/C. C. W. Jones; A/C.2 H. Jones; A/C.1 W. King; A/C.2 J. J. B. McAllan; A/C.1 D. S. McAllister; A/C.1 J. A. McEntyre; A/C.2 D. Massie; Cpl. J. A. Mawdsley; Cpl. A. R. Murgatroyd; Cpl. H. E. Phelps; A/C.1 R. Phillips; Cpl. G. C. R. Pizzey; A/C.1 A. A. Preston; L.A/C. G. R. G. Prior; Cpl. L. C. Protz; Air Vice Mshl. C. W. H. Pulford, C.B., O.B.E., A.F.C.; W/O. C. D. Ryan; Sgt. T. R. Scott; A/C.1 L. F. Scruby; A/C.1 A. E. Smith; L.A/C. G. Standen; L.A/C. D.; Stirling; Sgt. E. L. Sutton; A/C.2 G. S. Sykes; Act. Cpl W. C. Taylor; L.A/C. R. J. Tonkin; L.A/C. H. Vaines; /AC.1 S. Wilcock.

Royal Australian Air Force

MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. T. Nicolson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. W. K. Bennett, D. F. C.; Flt. Sgt. J. D. Bryant.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. J. S. P. Fitzpatrick; F/O. D. T. Leavitt.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. J. G. Anderson Flt. Sgt. J. H. Barton; Act. Flt. Lt. D. G. Buchanan; Act F/O. H. J. Burtt; F/O. J. N. Clark; P/O. T. W. Dale; Flt. Sgt. C. R. Ellis; W/O. R. J. Frizzell; P/O. R. J. W. Hey; Flt. Sgt. J. G. Hudson; Act. Flt. Lt. W. A. Irwin, D.F.C.; F/O. A. A. Kennedy; P/O. C. G. Nairne; W/O. J. M. Oliver; Flt. Sgt. S. A. Rae; W/O. J. W. Steed; W/O. E. J. W. Stirling; Act. Flt. Lt. N. A. D. Stokes; W/O. I. W. Trainor; W/O. R. R. Zellman.

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

AT THE SALUTING BASE in the Mall are Air Vice-Marshal S. D. MacDonald and Air Marshal Sir James Robb, watching R.A.F. aircraft practising for the V parade Fly-past.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Lt. P. A. Becker.

Casualty Communiqué No. 586

Of the names in this list, 298 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

MISSING, NOW PRESUMED KILLED IN ACTION.—L.A/C. E. A. Samwells.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—W/O. E. R. P. Adams; F/O. E. A. Barnett; F/O. G. Bell; P/O. A. L. Briand, D.F.C.; Flt. Lt. C. B. Bryan; F/O. W. J. Ceybird, D.F.M.; Flt. Lt. O. J. Clipsham, D.F.C.; W/O. J. H. Coates; Act. Sqn. Ldr. B. F. G. Darby; F/O. K. Dutton; Flt. Lt. E. Gibbons; F/O. K. Gill, D.F.C.; Flt. Lt. N. Harwood; F/O. T. J. Hedley; W/O. I. R. H. Iago; F/O. T. J. MacGregor; Flt. Lt. J. H. MacD. MacKinnon; F/O. W. R. MacLaren; Flt. Sgt. A. P. Mann; Flt. Lt. J. A. Mulcahy-Morgan; Flt. Lt. J. C. Randon; Flt. Lt. A. W. Shearer, D.F.C.; Flt. Lt. A. S. Smith; Act. Sqn. Ldr. G. M. Smith; F/O. S. J. Smith; Flt. Lt. H. Wood.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. Allman; Sgt. R. W. Ames; Sgt. B. J. Armstrong; Sgt. S. Ashmore; Sgt. J. Baggaley; Sgt. D. A. O. Balls; Sgt. J. Beeson; Flt. Sgt. R. W. Bentley; Sgt. A. R. Best; Flt. Sgt. H. M. Bluston; Flt. Sgt. P. H. Bode; Sgt. D. Bolton; Flt. Sgt. E. Bowring; Sgt. J. Boyle; Sgt. R. Brown; Flt. Sgt. R. S. Brown; W/O. E. S. Bruton; F/O. H. Burgoyne; Sgt. A. G. Butcher; Sgt. C. A. Butler; Sgt. J. F. W. Catlin; Flt. Lt. H. B. Clarke; Flt. Sgt. W. L. Cleary; Sgt. C. A. Coe; Flt. Sgt. L. Cohen; F/O. R. S. Cohen; Act. F/O. G. Coleman; Flt. Lt. H. T. D. Cooper; Flt. Sgt. D. J. Cornish; F/O. H. Coulton; Sgt. J. W. Cox; Sgt. K. S. Cox; Sgt. J. D. Craig; Flt. Sgt. B. F. F. Crimes; Flt Lt. A. McK. Cummings; Sgt E. Daley; Flt. Sgt. J. M. Davies; Flt. Sgt. W. R. Dawes; Act. F/O. T. C. Dawson; F/O. C. J. Daynton; Flt. Sgt. P. G. Deaves, D.F.M.; Flt. Lt. F. J. Dee; Sgt. E. Deller; Flt. Lt. R. H. Dodsworth; Flt. Sgt. R. W. Donaldson; Flt. Sgt. J. A. Dunning; F/O. K. J. Edmunds; P/O. C. Elleman; Sgt. C. D. Evans; Sgt. C. F. Farley; Sgt. G. Faulkner; Sgt. G. A. Fergus; P/O. D. I. B. Fisher; Sgt. J. C. Fiello; F/O. K. A. Foley; Act. Flt. Lt. F. J. Ford; Sgt E. A. Freeman; Sgt. J. Fulton; Sgt. E. Gedling; F/O. V. O. Gilbert; P/O. J. R. Gillespie; F/O. M. Gisby; Flt. Sgt. J. H. Goddard; F/O. T. H. Grace; Sgt. J. S. Gray; Flt. Sgt. W. R. Gregory; Sgt S. G. Griffiths; Sgt. D. F. Hadland; F/O. H. L. Hallam, D.F.C.; Sgt. V. M. B. Halls; Sgt. G. F. Harding; W/O. G. Harris; Sgt. G. Harrison; Flt. Sgt. F. A. Hawkins; P/O. K. W. Hewitt, D.F.M.; Sgt. W. C. Higginbotham; F/O. F. Hill; Act. Flt. Sgt. W. R. Hill; W/O. C. R. Hines; F/O. D. H. Hobden; Sgt. A. N. E. Holland; Sgt. R. H. Holliday; Sgt. D. A. Holmes; F/O. J. R. Holmes; Sgt. R. S. Hond; F/O. K. A. I. Hunt; Flt. Sgt. S. R. Hunt; Act. Flt. Lt. C. Hyde; Flt. Sgt. H. Insley; Flt. Sgt. D. Jackson; Act. Flt. Lt. A. Jameson; Flt. Lt. K. O. Jenkins; Flt. Sgt. R. M. Jenkins; F/O. V. C. P. Jewers; Sgt. A. Johnson; Flt. Lt. A. E. Johnson; Sgt. A. Jones; F/O. W. H. A. Jones, D.F.C.; F/O. F. M. Kennedy, D.F.M.; Sgt. J. Kennedy; Flt. Sgt. D. A. Kenningham; Sgt. P. R. Kingman; Sgt. J. E. Kitchen; Sgt. E. P. Knight; Flt. Lt. J. B. Lamb; F/O. B. F. Lambert; Sgt. W. E. Lane; Sgt. T. A. Lawless; Sgt. E. Leather; F/O. R. Limbert, D.F.C.; Sgt. S. J. Lovett; Flt. Lt. J. F. Lown; Sgt. G. E. Lowndes; F/O. A. R. L. Lundie; P/O. C. D. Mackenzie; Flt. Lt. A. A. McIntyre; Sgt. D. McKay; F/O. C. J. F. Marchand; Sgt. J. R. Marriott; Sgt. R. B. Mason; Sgt. L. D. A. Mawson; Sgt. K. Merritt; Sgt. C. E. Miller; Sgt. T. D. Mitchell; P/O. W. E. Moore; Act. Flt. Lt. G. H. Montgomery; Flt. Sgt. E. A. Morley; Flt. Sgt. G. R. Morris; Flt. Lt. N. L. Morrison; Flt. Sgt. C. K. Morton; Sgt. A. J. Mouat; Sgt. A. G Murray; Flt. Sgt. R. Neale; Act. Sqn. Ldr. W. A. S. Neill; Sgt. D. A. Nelson; F/O. A. E. Nevard; F/O. L. C. Newman; Sgt. G Nixon; Sgt. W. C. Norman; P/O. J. T. W. G. Norris, D.F.M.; Sgt. T. B. O'Donnell; F/O. M. W Oliver; Sgt. R. D. Ovis; Flt. Sgt. C. M. Owen; F/O. G. W. Palmer; F/O. G. A. Parrish; Sgt G. E. Patterson; W/O. G. H. Pearson; Flt. Sgt J. H Peill; Sgt. D. J. Perkins; Sgt. J. Perry; Sgt. H. R. Porter; W/O. H. C. Porter; Act. F/O. K. Potts, D.F.C.; Sgt. L. O. Precieux; Sgt. A. I. Prescott; Sgt. G. I. Rees; Sqn. Ldr. G. St. C. B. Reid; Sgt. A. Reilly; W/O. A. F. Richardson-Jones; Sgt. K. S. Riley; F/O. F. Roberts; F/O. S. Rodgers; P/O. C. M. Rosay; F/O. J. Ross; W/O. L. Rourke; Act. F/O. V. G. Sagar; Flt. Lt. N. R. Schwartz; F/O. J. N. L. Scott; Sgt. R. Scott; Flt. Sgt. H. B. Sharp; Sgt. G. Sharrocks; Flt. Sgt S B. Shaw; Flt. Sgt J. S. Shearing; Sgt. J. G. Shepherd; P/O. N. G. Sievwright, D.F.C.; Flt. Lt. H. R. Sindall; F/O. K. G. Slade-Betts; W/O. C. Smith; Sgt. D. R. Smith; W/O. T. R. W. Smith; Sgt. J. A. Sparke; F/O. J. D. Spencer; Sgt. H. Stainthorpe; Sgt. K. Steel; Sgt. R. A. Steel; Act. Sqn. Ldr. J. L. Steele, D.F.C.; Sgt. C. Stepney; P/O. J. Stevenson; Sgt. A. Stewart; Flt. Lt. F. C. W. Stewart; W/O. C. J. Stirk; Sgt. W. J. Stockwell; Sgt. R. C. Stopp; Sgt. R. M. Swinbank; Sgt. J. D. J. L. Tarlton; F/O. K. E. F. Taylor; Sgt. W. L. Taylor; Flt. Sgt. G. B. Thomas; Sgt. H. Thomson; Flt. Sgt. K. Tonks; Sgt. J. T. Tunstall; F/O. B. E. Turnbull; Sgt. D. R. Vincent; Sgt. A. J. Ward; Sgt. R. E. Ward; F/O. D. Washer; Flt. Sgt. E. H. P. Watkins; Sgt. L. G. Weir; Sgt. R. A. Wells; Sgt. L. F. Whale; Flt. Sgt. S. Willis; Flt. Sgt. J. Wilson; P/O. J. L. Wilson; F/O. J. Woods; Sgt. W. E. Wright.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—W/O. L. A. Colarossi; P/O. B P. Daniel; Sgt. I. N. Davidson; P/O. L. A. Emmerton; Flt. Lt. H. A. Farthing; F/O. J. E. Morrison; Sqn. Ldr. [illegible] Savage; Sqn. Ldr. J. D. Tillott; Flt. Sgt. [illegible] Wood.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. [illegible] Snowdon.

Badge of No. 5 Group Headquarters Royal Air Force—"Undaunted."

Badge of No. 76 Bomber Squadron, Royal Air Force—"Resolute."

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. Aitchison. Sgt. H. G. Backway; Sgt. W. Cheesman; Sgt. C. F. Hillier; Sgt. C. Lloyd; Flt. Lt. W. A. Moore; F/O. M. D. Pickersgill; W/O. H. M. Stevens; Flt. Lt. R. C. Thorn; P/O. C. J. Weight; P/O. G. E. Widdicombe.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. T. D. Dominie; L.A/C. E. F. Murphy; W/O. A. G. White.

DIED ON ACTIVE SERVICE.—Cpl. L. Allan; L.A/C. K. G. Allson; L.A/C. E. T. Arnold; A/C.1 J. H. Ashurst; L.A/C. L. M Bennett; Cpl. B. Brinsdon; A/C.1 R. R. Burgess; A/C.1 D. T. Clark; L.A/C. G. G. Clarke; Cpl. S. Cowen; Cpl. G. Davey; L.A/C. G. G. Davies; A/C.1 J. M. Davies; A/C.2 J. Dawson; F/O. R. D. Dodds; Cpl. A. R. Gant; Sqn. Ldr. E. W. B. Griffiths, M.B., F.R.C.S.; L.A/C. G. A. Hall; A/C.1 T. J. Hall; A/C.2 L. J. Harvey; A/C.2 C. W. B. Horne; L.A/C. G. E. Hunt; Sgt. E. J. Hutchinson; A/C.2 E C Ineson; A/C.1 E. W. Jones; A/C.1 N. McGladdery; A/C.1 G. A. McIlwraith; Act. Cpl. C. E. Mitchell; Cpl. L. A Mugridge; Cpl. T. Murphy; L.A/C. H. Orr; F/O. D. W. Poynter; A/C.1 G. L. Raeburn; Sgt. B. Ragan; F/O. S. T. Rees; Sgt. A. P. Robertson; A/C.1 F. W. Rowland; A/C.2 W. H. R. Rudd; L.A/C. J. A. Ruscoe; L.A/C. R. E Shrewsbury; Cpl. F. W. Slaughter; W/O. I. Thomas; Act. Flt. Lt. L. F. Wellington; A/C.1 L. Wilson.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.2 C. S. A. Stewart.

Royal Australian Air Force

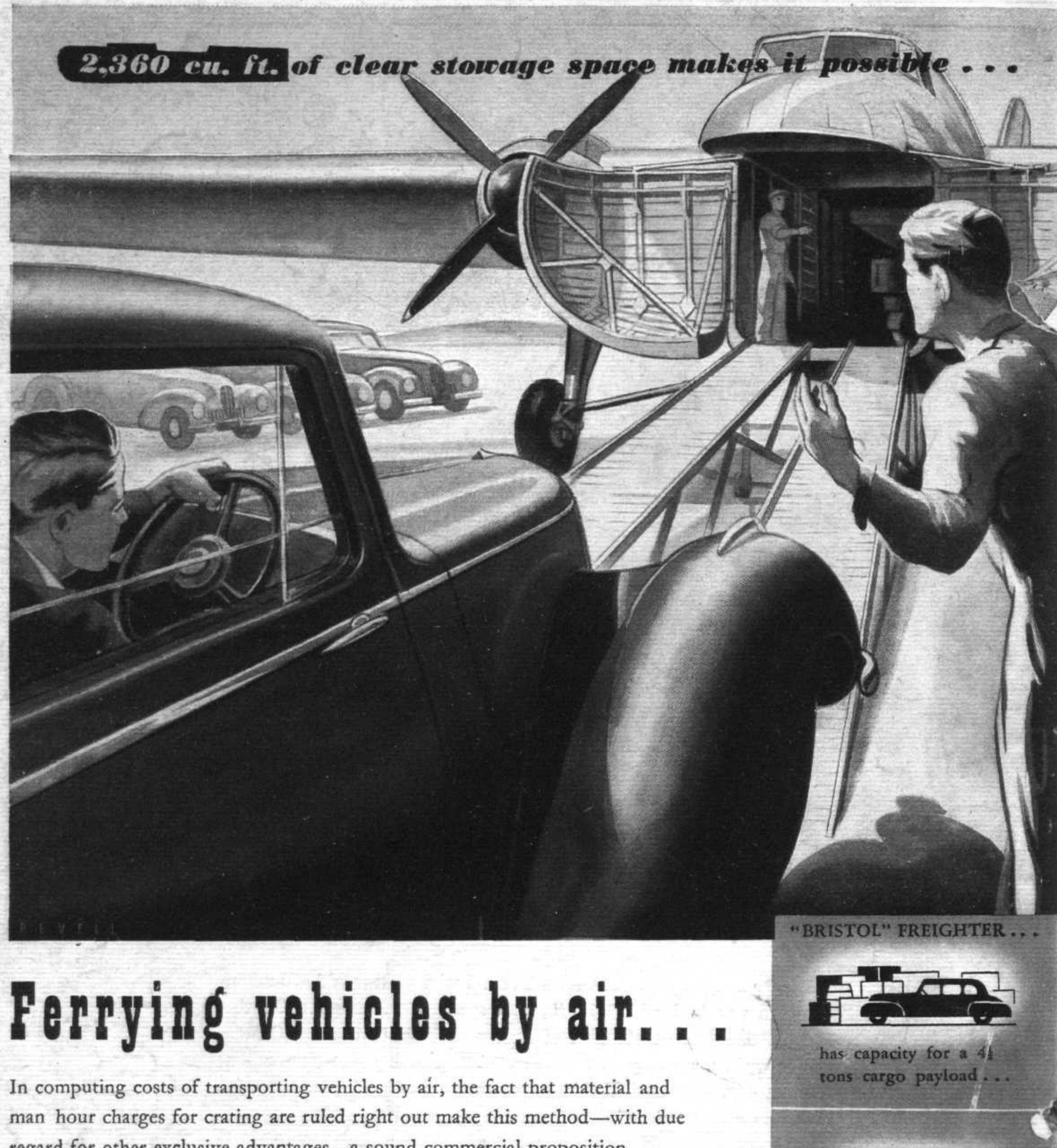
PREVIOUSLY REPORTED MISSING, NOW [illegible]SUMED KILLED IN ACTION.—P/O. W. D. Appleyard; Flt. Sgt. V. G. Bambrick; Flt. Sgt. E. E. Birch; Flt. Sgt. R. J. Boag; F/O. G. W. Brown; W/O. S A. Folbigg; Flt. Sgt. A. B. Hartley; Act. F/O. B. J. Henderson; Flt. Sgt. W. V. Johnstone; Flt. Sgt. E J. L. Klemm; F/O. E. K. L. Langton; F/O. T. J. Lennie; W/O. E. J. McGilvray; W/O. K. G. Potter; Flt. Sgt D. A. Reid; Flt. Sgt. M. K. G. Roy; F/O. T. H. Simpson, D.F.C.; F/O. P. A. Stuart; Act. F/O. E. P. Twynan; Flt. Sgt. B. L. Williams.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. R. J. Aitchison; W/O. D. L. Burke; P/O. A. R. Galletly; W/O. J. H. Grubb; F/O. N. A. Heffernan; P/O. A. P. Hoare; Flt. Lt. J. E. Jenkinson; Flt. Sgt. J. Lamont; Flt. Lt. P. Langston; P/O. K. C. Loe; Flt. Sgt. S. E. Mosley; F/O. A G. P. Newman; Act. Wing Cdr. R. J Newton, D.F.C.; Flt. Sgt. A. A. Simpson; Act. Flt. Lt I. T. Yanovich.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Capt. J. F. Kinnery



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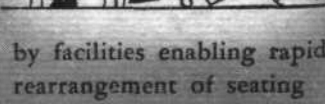

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