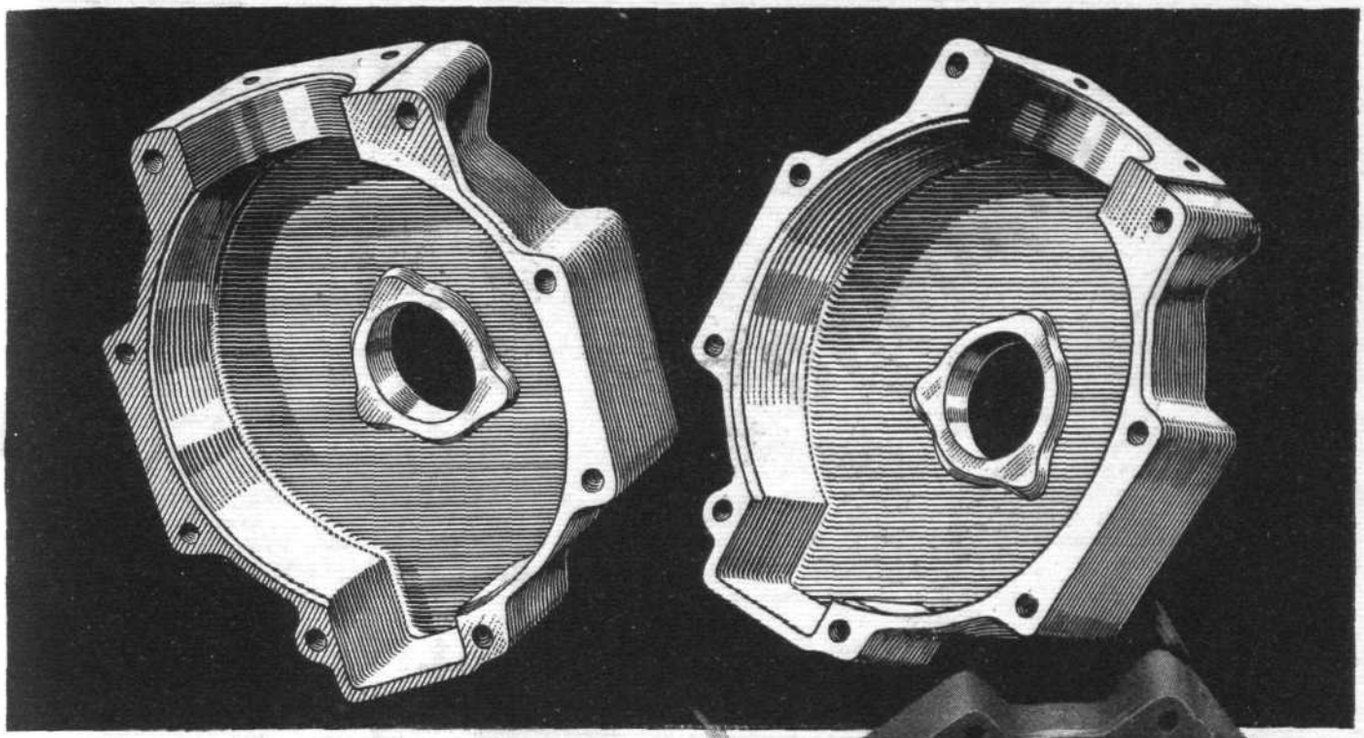
MARCH 13th, 1947

FLIGHT

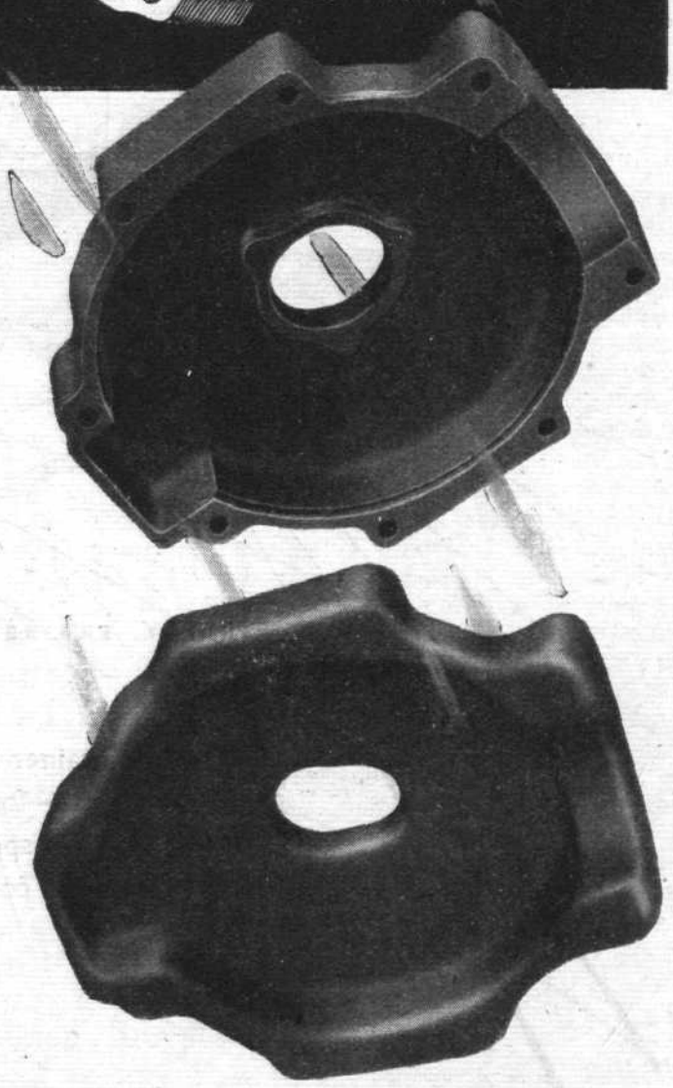
and

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB ONE SHILLING



CAST AWAY DEAD WEIGHT



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MAGNESIUM ALLOYS

FLIGHT and AIRCRAFT ENGINEER

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The Outlook

The Air Estimates

THAT the Royal Air Force had become our front line of defence in the recent war is no longer denied. Consequently the nation must be prepared to pay the premium exacted for the insurance which the R.A.F. represents. In the White Paper on Defence issued recently, the net estimates for the three fighting services were: Army, £388,000,000; Air Force, £214,000,000; and Navy, £196,700,000. That the R.A.F. should be so far above the Navy in its allocation is an indication of how the defence picture has changed during the last few years. One doubts that the general public fully realizes the fact. The amount by which this year's Air Estimates exceed the Navy Estimates is as great as the total of the Air Estimates some ten or twelve years ago.

There is some difficulty in forming a clear picture of this year's Air Estimates, due to the fact that although the pre-war practice of "inter-departmental adjustments" has been resumed, the Ministry of Supply is responsible for research and development, and there are other changes compared with the Air Estimates of the years between the wars. The greatest increase is that of Vote 7 (Technical Supplies and Services) which is estimated to need £41,084,000 more than last year, but this is almost entirely due to the fact that supply is now borne on the Air Estimates instead of the Ministry of Supply.

Subhead A of Vote 7 is for aircraft, engines, spares and various equipment and accessories, and the amount set aside is £42,750,000. That is an impressive figure, but one wonders how much is to be spent on new aircraft and power plants. In his Memorandum the Secretary of State for Air states that "The greatest possible use will be made of existing stocks of equipment, and the programme of re-equipment is confined to a minimum." That might mean that much of the money will be spent on overhauls, repairs and modifications.

If the Government wants to save, there are other aspects than the purchase of equipment to which attention might be drawn. For example, Vote 5 (Movements) shows a net increase of £2,612,000. Bearing in mind that the number of personnel has been cut by half, from 760,000 to 370,000, the need for this is not very obvious, nor is Mr. Noel Baker's statement very convincing when he says that "the release of each man may involve several consequential postings." It should be possible to move all the 370,000 to some tune for the cost of a gross total of more than £8 million!

In the Air Ministry, too, there would appear to be scope for economies. Although it will have to administer less than half the number of "bodies," the vote has decreased by but £113,500 and shows a gross value of £3,435,000 for salaries and wages. An examination of the details reveals that the scale of salaries certainly cannot be deemed extravagant. The motto appears to be "never let one man do a job if two can do it." That 11,383 people should be necessary to run the Air Ministry appears somewhat remarkable, and one's surprise is not greatly allayed by the footnote which states that "of the number, 20 civilian staff are serving with the Forces."

Most expensive is the Department of the Permanent Under-Secretary of State, with £1,586,000 to pay the 4,407 people of whom 3,195 are "other clerical staff" absorbing £848,500 out of the total.

Icing Research

A SERIES of important test flights in icing conditions have recently been completed with the Viking aircraft, and some of the results are summarized elsewhere in this issue. This is the first time that a transport aircraft has taken off day after day in search of ice and, having found an icing area, flown in it to allow ice to build up in order to observe its formation and make a film-recording of it.

The flights were undertaken as a result of instances

of suspected elevator overbalance, which necessitated the precautionary withdrawal of the Vikings from B.E.A. services. In achieving their primary aim of investigating and curing the defect in the shortest possible time, the tests have been most successful, and to a great extent this is due to the concerted efforts of the Vickers test and design teams and B.E.A.'s chief pilot, to all of whom great credit is due. With the reapproval of Vikings for service an unfortunate incident can be forgotten, and the icing tests considered as an important and overdue research.

Arising from the tests of anti-icing and de-icing is proof that the fluid-type system can do its job adequately, but only with flow rates greatly in excess of those previously laid down by the A.R.B. and now up for revision. In this sense the de-icing problems were not particular to the Viking, upon which attention was focused only because the aerodynamic effects of ice formations, with which the system as originally fitted could not deal, might have rendered it extremely difficult to control.

Fortunately, practical icing tests are to continue until every scrap of information with regard to rates of fluid flow and ice accretion has been obtained. The industry as a whole is now to benefit from the researches of a single company, but would it not have been preferable to have avoided the troubles, delays and blow to prestige by *national* research at an earlier stage?

Forward the "Fifty-two"!

VISITING Northrop Aircraft, Inc., for a conference "with the company's engineers, leaders in U.S. aviation research, and developers of the flying wing design which results in far more efficient airplanes," Mr. John Cunningham, de Havilland's chief test pilot, is reported to have expressed himself in the following terms: "Although the British hold world speed records and are pacing jet engine development, they are trailing the United States in research on the new and highly efficient flying wing airplanes." "The British," he is further credited with saying, "are still in the planning stage on a 90,000lb flying wing," whereas at the Northrop plant he examined the B-35 all-wing bomber built for an overload gross weight of more than 105 tons.

There are no greater admirers of the big Northrop than those British designers who are familiar with the problems of flying-wing design. While none of these can claim credit for a "wing" approaching the B-35 in size, Armstrong-Whitworth have produced, to the designs of Mr. John Lloyd, a machine which in pure research value must rival the Northrop, embodying as it does such features as jet propulsion, boundary layer control by suction and a novel control system which may well prove a major advance in flying-wing design.

The trials of this machine—the A.W.52—have been delayed by incidental troubles in no way concerned with its basic design, whereas the first B-35 has been flying since last summer, the second is nearly ready and a jet-powered version is well advanced. Nevertheless, the "52," backed by exhaustive glider research, must be considered one of the most significant aeronautical developments for many years, and its accomplishments may greatly enhance our international reputation now founded so largely on the world's speed record and the advanced state of jet development.

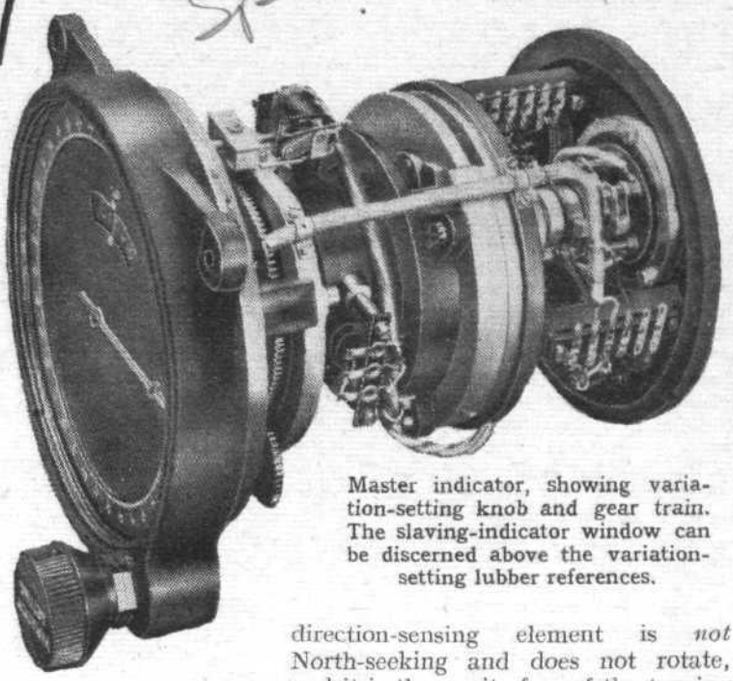
CONTENTS

"The ice was here, the ice was there, the ice was all around."

ANCIENT MARINER: After ten years' service in frigid, temperate and torrid zones, the Short Sunderland remains standard R.A.F. equipment. This scene at Felixstowe recalls Coleridge's lines describing the ghastly voyage through the ice.

THE GYROSYN COMPASS

Dead-beat Stabilized Indications Monitored Relative to Earth's Magnetic Lines of Force : No Turning Errors : True Course Readings Given

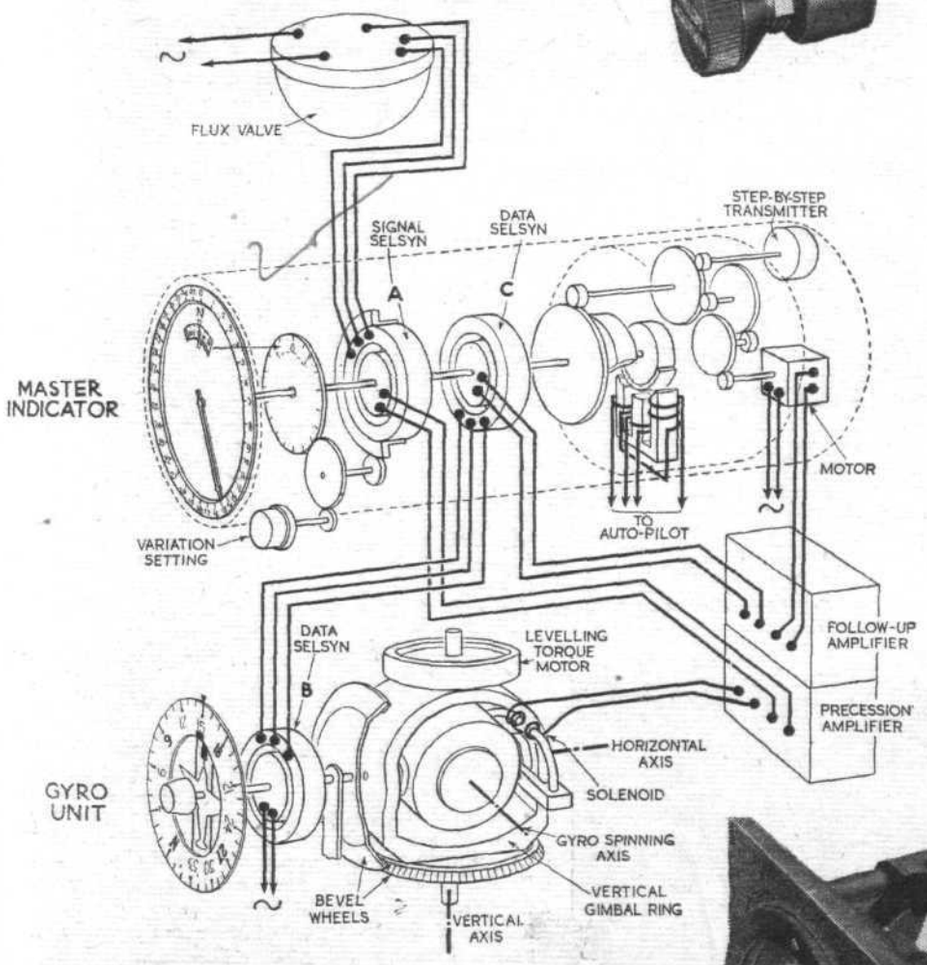


Master indicator, showing variation-setting knob and gear train. The slaving-indicator window can be discerned above the variation-setting lubber references.

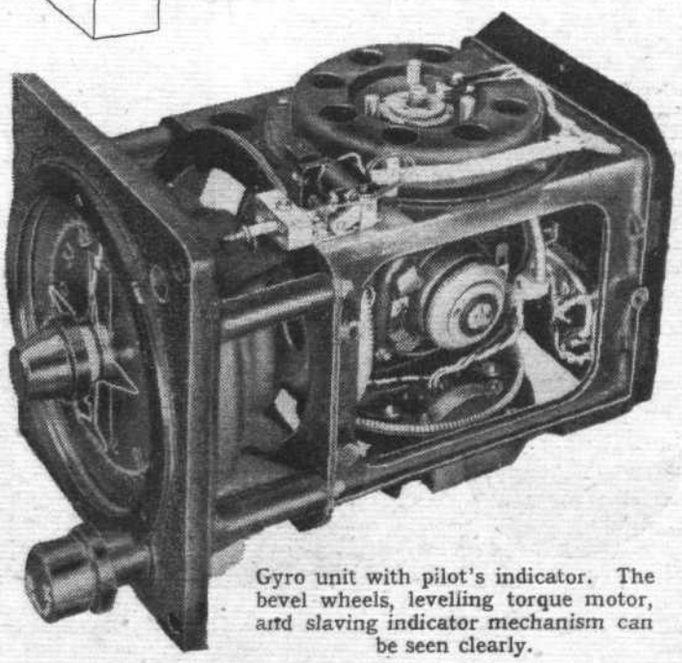
UNTIL the present decade, directional reference other than celestial bodies had been made possible only by a pole-seeking magnet of one form or another. During the war a breakaway from ten if not twenty centuries of traditional navigation practice came with the advent of various types of gyro-stabilized compass. In all of these the basic innovation was in the use of a compass indication stabilized by a gyroscope in order to eliminate the errors inherent in a magnetic needle. Not all of the new compasses, however, were able to eliminate these inherent vagaries, but in the latest and most highly developed form, the Gyrosyn, made by the Sperry Gyroscope Company, and briefly described in our issue of October 3rd, 1946, dead-beat unfluctuating indication is achieved.

In essence, the operation of the Gyrosyn can be summarized as a direction-sensing element used to feed information to a gyroscope which accordingly adjusts the readings of repeater indicators. It must be emphasized that the direction-sensing element is *not* North-seeking and does not rotate, and it is thus quite free of the turning errors, etc., inherent in a North-seeking magnet. In point of fact, the element—known as a flux-valve—is an electro-magnetic device which senses the direction of the lines of force of the earth's magnetic field, and since each of these lines of force is, in effect, a miniature magnetic meridian, the location of magnetic North is fixed by defining their direction; but it must be repeated that the flux-valve does not *seek* North, it merely defines which way the lines of force run.

The flux-valve is usually mounted in the wing-tip, where deviation effects are negligible, although it can naturally be fitted in any alternative position where appropriate conditions obtain. A corrective adjustment incorporated with the unit permits what little deviation is present to be fully neutralized. Briefly, the flux-valve consists of three radial "spokes" disposed equally about an exciter coil



Schematic diagram of Gyrosyn units and wiring circuits. For understanding of the operational sequence this drawing should be studied in conjunction with the text.



Gyro unit with pilot's indicator. The bevel wheels, levelling torque motor, and slaving indicator mechanism can be seen clearly.

THE GYROSYN COMPASS

"hub," the whole being pendulously suspended by a universal attachment. Each of the three spokes carries a pick-up coil, and alternating current at 400 cycles fed to the exciter coil alternately pulses the earth's magnetic lines of force in to and out of the three spokes. The effect of this is to produce an alternating differential voltage at 800 cycles in the three-leg coils, and this is fed to the stator of a selsyn. (*A* on the schematic diagram, p. 207.)

Selsyns are electro-magnetic devices essentially consisting of a stator and rotor, the main characteristic being that, when a voltage is produced in the stator, the rotor automatically and instantly tends to align itself with the polar diagram of the stator voltage. It may thus be appreciated that the name "selsyn" is a telescoped contraction of "self-synchronizing."

Referring to the schematic drawing, it will be seen that the rotor of selsyn *A* is electrically coupled to a precession amplifier, this in turn being wired to a solenoid attached to the vertical gimbal ring of the gyro. It may also be seen that a bevel wheel is mounted at the base of the vertical gimbal ring, this wheel meshing with another bevel carried on a shaft which drives the card of the pilot's indicator, and also carries the rotor of data-transmitter selsyn *B*. The stator of this selsyn is wired to the stator of a further selsyn *C*, the rotor of which is mounted on the same shaft as that of selsyn *A*, and is wired to a follow-up amplifier. This latter unit is wired to a motor which, through a gear train, drives the shaft of the master indicator.

Sequence of Operation

Now, to take the operational principle sequentially: the flux-valve is pulsing, and, therefore, sensing the direction of the lines of force of the earth's magnetic field. In so doing it is feeding a specific voltage to the stator of selsyn *A*. We will assume that the rotor of this selsyn is not lined-up with the polar diagram of the voltage produced in its stator; in this event a signal is sent to the precession amplifier, where it is boosted and fed to the solenoid on the vertical gimbal ring of a gyro. According to the direction of the discrepancy in rotor/stator position of selsyn *A*, the solenoid is energized to exert an appropriate torque about the horizontal axis, and so cause the gyro to precess in the required direction.

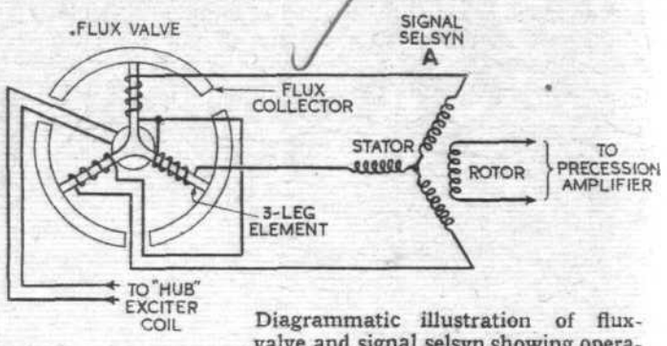
The precessional motion of the gyro is transmitted through the bevel wheels to the shaft of the indicator card and rotor of selsyn *B*. There will thus be an alteration in the rotor/stator alignment of selsyn *B* and, therefore, in the rotor/stator line-up of selsyn *C*, since *B* is purely a data transmitter. The discrepancy in *C* causes a signal transmission to the follow-up amplifier, where it is boosted and used to energize the motor, which will accordingly rotate the shaft of the master indicator to the new heading, at the same time aligning the rotors and stators of selsyns *A* and *C*.

Due to such causes as bearing friction, every gyro has an inherent tendency to drift. This tendency is compensated by the resulting misalignment of rotor and stator of selsyn *B*, and thus of *C*, signalling the follow-up amplifier to energize the motor and thus misalign rotor and stator of selsyn *A*. This signals the precession amplifier which accordingly energizes the solenoid to precess the gyro back to heading.

The gyro itself is actually a three-phase squirrel-cage induction motor, which runs at 23,500 r.p.m., the casing being a light-alloy cylinder, the base of which is spanned by a diametral bridge-piece wherein the bottom bearing for the rotor shaft is housed. This is a 7-ball bearing, the balls being housed in a plastic cage. To facilitate balancing, the gyro rotor is made from a special homogeneous mild steel, and is of cup cross-section with a central "stalk" shaft. The interior is sleeved with a pressed-in cylindrical insert of aluminium alloy centrifugally cast about a laminated core, and this forms the squirrel cage part of the rotor motor.

The top cover of the gyro casing is of light alloy, and carries the stator windings of the motor around a cylinder which encloses the rotor stalk. The latter projects up through the top cover to engage the upper ball bearing (identical with the base bearing), which is housed in a brass cup, itself a close fit in an integral cup formed in the top cover. Enclosing the top bearing is a cover-cap housing a small coil spring, which axially pre-loads the bearings and compensates for temperature changes.

On the outside of the gyro case, at right angles to the rotor axis, are integrally cast cups into which are recessed bearing spigots. Electrical connections for power supply to the rotor are made through axial contacts inside the bearing spigots.



Diagrammatic illustration of flux-valve and signal selsyn showing operative circuit.

The journal of each spigot engages a ball bearing housed in a threaded cup, which is screwed into the vertical gimbal ring. Leaf-spring contacts on the gyro case pick up the axial contacts at the base of the bearing spigot; similar leaf-spring contacts pick up the opposite end of the spigot on the outer gimbal ring. It may be noted that the rotor case itself forms the inner ring of the gimbal.

On the top of the outer (vertical) gimbal ring is the rotor of a "levelling torque motor," the squirrel cage part of the motor being fixed to the case housing the unit. The purpose of this is to ensure that the gyro spinning axis is always perpendicular to the vertical axis. If these axes tend to diverge from the normal, an electrical contact is made which energizes the levelling torque motor: this then tends to turn the gimbal ring about its vertical axis, but owing to the inertial stability of the spinning gyro it cannot succeed, and the result is to precess the gyro back to the position in which its axis is at right angles to the vertical axis.

The gyro unit, data selsyn *B*, and pilot's indicator are all comprised in a single component for mounting in the instrument panel. According to established British practice, the indicating card is a "moving" type so that the pilot always knows his orientation relative to North and map reference is thereby facilitated. In the centre of the instrument face is a fixed outline of a miniature aircraft and a heading indicator. Matching this is a course indicator and grid lines which can be

Units of the Mk IV B Gyrosyn. At top is the unit comprising the precession and follow-up amplifiers, and beneath, left-to-right, are the flux-valve, master indicator, gyro unit, and junction box.

THE GYROSYN COMPASS

re-set by means of the setting knob in the centre of the dial.

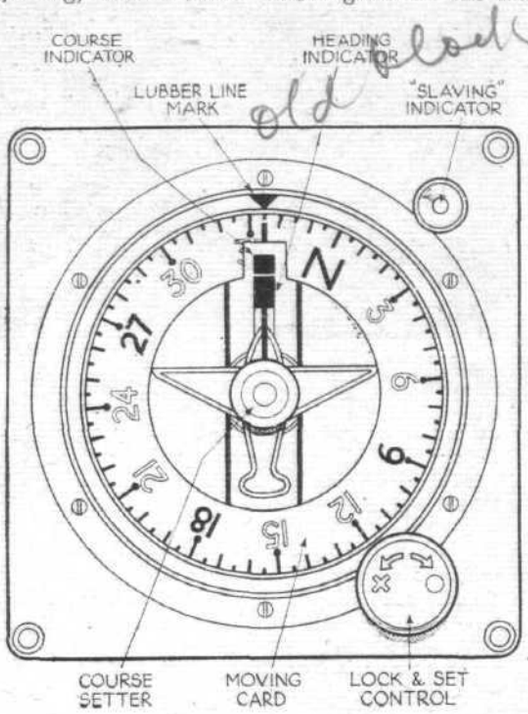
In the illustration the heading is shown to be 335 deg and the aircraft on course. Now let us suppose it is desired to change course to 270 deg. The pilot pushes in the central setting knob and turns it anti-clockwise until the course indicator and grid lines are opposite 270 deg. He then turns his aircraft to port and, as he turns, the compass card, grid lines and course indicator will simultaneously rotate clockwise. When the course indicator (at 270 deg) is once more lined-up with the heading indicator, the aircraft will be on the required course. There are no turning errors, the indications are dead-beat, and the instruments can be used for turning indication in precisely the same way as the conventional directional gyro; in fact, the latter is made redundant by installation of the Gyrosyn.

The dead-study indications and the shape of the matching references for course and heading make it not difficult for a pilot to hold his aircraft to a mean tolerance of one degree to the selected course.

At the lower right of the face is a lock-and-set control, and in the upper right corner a window for a slaving indicator. Slaving indication is provided in the form of a cross and a dot which alternately appear and vanish at the window. The "flag" carrying these indication marks is actuated in conjunction with the solenoid on the gimbal ring, cross or dot appearing accordingly as the gyro is precessed one way or the other. Thus, so long as the cross and dot flick on and off at the window, the pilot will know that the gyro is being monitored by the flux-valve and thus all is well. Additionally, it allows the pilot to line-up the gyro when starting a flight: he merely turns the knob in the appropriate direction as shown by the cross or dot at the window, and when the blank space between them appears the gyro is accurately lined-up with the magnetic heading.

The master indicator is for the navigator, and the instrument dial is of 4¾in diameter, calibrated in one-degree divisions. The interior area of the dial (that is, inside the divided circle) is recessed, so that the indicating needle is flush with the peripheral surface. In this way the readings indicated are "edge-to-edge" and parallax is consequently eliminated; so clean are the divisions and so precise the indication of the needle that readings to a half degree are easily possible.

A window for "cross and dot" slaving indication is provided in the centre of the upper part of the dial and, below this, an arcuate window in the dial displays a graduated circle by means of which the amount of local magnetic variation can be set. This is done by a knob at the lower right corner which moves, through a gear train, the interior graduated circle and also a sleeve housing the stator of selsyn *A*. Supposing that the amount of local variation is 10 deg. W; this is set on the scale and thus displaces the stator of *A*. At once the correcting action is set in motion through the system, and when all the selsyn rotors and stators are aligned once more, the indications given on the master and pilot's indicators will be corrected for variation. By virtue of this, and since deviation is compensated out by the adjustment incorporated with the flux-valve, the headings given on the indicators will be True courses. This in itself is no mean advance in navigational practice.



The pilot's indicator is of the moving-card type, in conformity with British practice, so that orientation to North is apparent in the natural sense.

In the Gyrosyn Mk IV B, which we have appraised, a step-by-step transmitter is driven off the gear train in the master indicator in order to provide directional reference for such auxiliary equipment as D.F. loops, A.P.I.s, H2S and other radar devices. In addition, an electromagnetic pick-off system is also incorporated in the gear train transmission so that directional reference may be signalled to an automatic pilot.

Simplified Version

For use in smaller aircraft a simplified Gyrosyn is available, cutting out the master indicator. The signals from the flux-valve are fed direct to the selsyn mounted on the gyro/indicator-card shaft. Effectively, it is selsyn *A* which takes the place of selsyn *B*, the latter being purely a date transmitter which, in this case, is superfluous. This simplified version is designated the Mk G IV F.

In both types of Gyrosyn Compass the power supply to the system is 400 cycles, 3-phase A.C., at 115 volts, and the consumption is 90 watts.

Unit weights are as follows: flux-valve and compensator, 1¼ lb; gyro unit, 6¼ lb; master indicator, 7¼ lb; amplifier unit, 8½ lb; junction box, 2 lb. If an allowance of 10 lb is made for cabling, a typical installed weight of 35¼ lb would be given for the Mk G IV B. Since the G IV F, however, comprises only the flux-valve and compensator, the gyro unit, and the amplifier, a representative installed weight for this installation would approximate to 16lb.

DEATH OF PAULINE GOWER

WITH the death of Mrs. Fahie, better known as Pauline Gower, within a few months of the tragic loss of her friend and one-time partner, Dorothy Spicer, British aviation has lost a fine champion, and one with long practical experience of flying. She learned to fly in 1930, and the following year obtained her "B" licence. With Dorothy Spicer she operated her own air taxi company, Air Trips, Ltd., and they had their ground engineers' licences, too, and did their own overhauls and repairs. At a time when so many women were in aviation largely for the publicity, these two were earnest workers and thoroughly deserved their success.

The late Mrs. Fahie, who will always be remembered in aviation as Pauline Gower.

She was a member of the Gorell Committee on civil aviation, and when the A.T.A. was formed, Pauline Gower became commandant of the women's pool of pilots, which included many famous names. In 1941 she went to America to organize a women's ferry service. Until her marriage in 1945 she was a Government director of B.O.A.C.

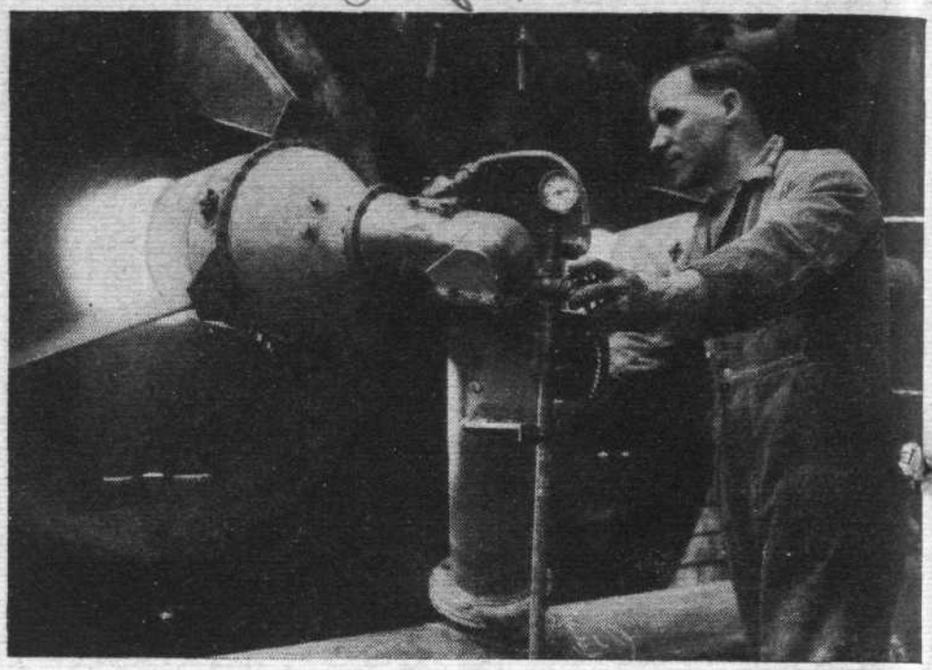
ADVICE, SALES AND SERVICE

AUTOMOBILE AND AIRCRAFT SERVICES, LTD., who recently opened new showrooms at St. James's Street, London, S.W.1, have planned an organization to give sound practical advice to intending purchasers of road vehicles, marine and aircraft. By arrangement with Airwork, purchasers of aircraft receive an after-sales service at the Airwork airfields at Gatwick, Heston, Denham, Booker, Renfrew and Perth. This service can also be arranged for other private owners. A. & A. Services are booking agents for air charter for which fully qualified and licensed pilots or other crew members can be supplied if required. The technical staff is headed by Major R. H. Mayo, the chairman, whose knowledge of aircraft and design is well known. His cousin, Mr. C. T. J. Mayo, is managing director. Mr. Hubert S. Broad, the well-known test pilot, is a director and head of the Marine Craft Division.

APPOINTMENT

MR GEORGE DOWTY, who founded Dowty Equipment, Ltd., in 1930, has now become chairman as well as managing director of the company. His new appointment as chairman is in succession to the late Mr. A. W. Martyn. Mr. Dowty is also president of the Canadian company and the Dowty Corporation of New York.

HERE AND THERE



FORCED DRAUGHT : To relieve the coal shortage Rolls-Royce Nene gas turbine burners are being used by Avros to heat the boilers at their Chadderton works, so keeping 5,000 people in employment. The three tons of coal per hour consumed by the boilers is replaced by 25 cwts of oil.

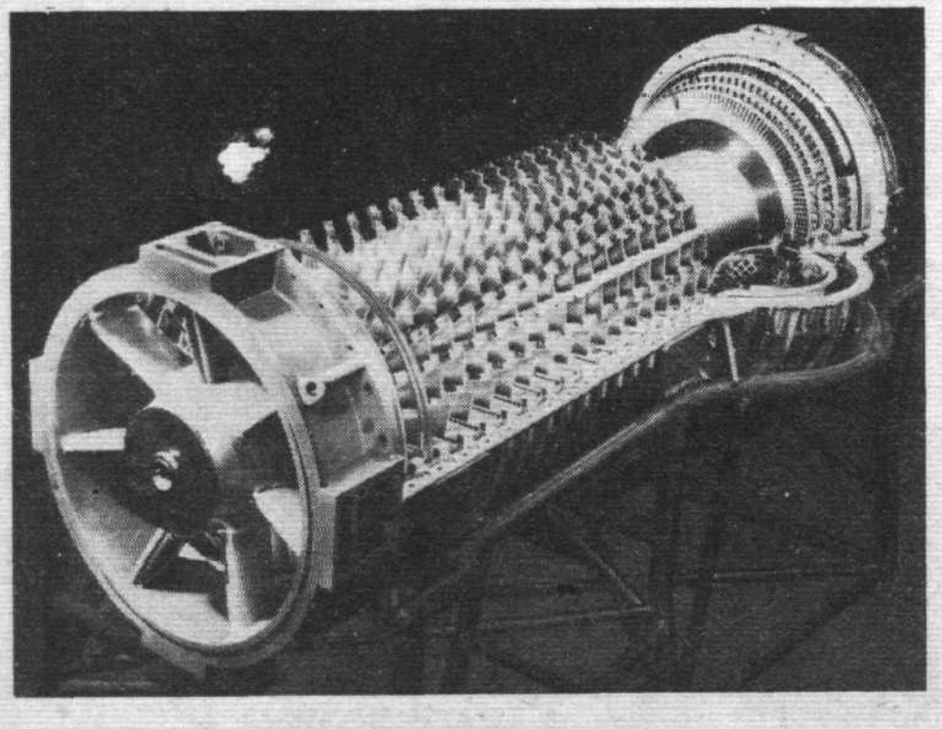
Clothing the Enemy

ORGANIZERS of the "Save Europe Now" fund have asked the R.A.F. to assist with the transport of 30 tons of urgently required clothing from the United Kingdom to Hamburg.

All the spare capacity in the two Dakotas which Transport Command run daily between Abingdon and Buckeburg and Hamburg will be used for this task. It is hoped that about 3,000 lb of clothing will be carried each day.

New French Ministry

CERTAIN changes have been made by M. Ramadier's government in the matter of air organization. Previously the French Air Ministry, or rather the *Armeé de l'Air*, was one of three, the others being the *Armeé de Terre* and the *Armeé de Mer*, all three under a Ministry which dealt with personnel and another which handled material. Civil aviation was in charge of a Secretary-General in the Ministry of Public Works and Transport. This system has now been abandoned, and the French Air Ministry is now an independent one, as are those of War and Marine. Civil aviation remains as it was, with M. Jules Moch at the Ministry of Public Works and M. Max Hymans as Secretary-General of Civil Aviation. Chief of the purely military Air Ministry is M. André Maroselli.



Northrop-Hendy Turbine : From this first picture of a new American unit known as the Turbodyne, the principal features are seen to be an 18-stage axial-flow compressor, an annular combustion chamber, and a turbine with several stages. No data have yet been released. When they reach a sufficiently advanced stage of development Turbodynes may be installed in the Northrop YB-49 flying-wing bomber. The first YB-49 will probably have eight General Electric I-40s, to give the total requirement of 32,000 lb. thrust.

American Interest in Rolls-Royce Jet Engines

FOLLOWING upon the sales agreement between Rolls-Royce and the Taylor Turbine Corporation of New York, two Rolls-Royce Nene jet engines are undergoing trials at the Air Material Centre, Philadelphia.

One engine has already completed a 150-hour U.S. A-N type test at 4,500lb thrust, and a second test at 5,000lb is now being run.

The Britannia Trophy

MANY "old-timers" are expected to attend the presentation by Lord Brabazon of Tara of the Britannia Trophy awarded by the Royal Aero Club to G/C. Donaldson for his speed-record flight of 616 m.p.h. Some 13 previous holders of the trophy are still alive, and several have intimated their intention to be present at the little ceremony, which will be held at Londonderry House at 3 p.m. on March 19th.

Olympic Games Gliding

LORD KEMSLEY has undertaken to guarantee the £1,000 which the British Gliding Association estimates will be necessary to cover expenses in holding the gliding contests of the 1948 Olympic Games in Britain. These are the first gliding contests to be held in conjunction with the Games. Application for the use of an airfield with accommodation and messing facilities has already been made.

B.E.A. Beats the Weather

IN the North of England, where all forms of surface transport have been seriously disorganized by ice and snow, British European Airways' English Division has maintained its services with very little delay. Aircraft have continued to operate without mishap between Liverpool, Manchester, Blackpool, Carlisle, Isle of Man and Belfast, with only minor deviations from schedule. Only temporary delays while runways have been cleared of snow have interfered with the normal operations. Captains of B.E.A.'s airliners on the

FLIGHT
Mar. 13,
1947
Advt. i.

D E H A V I L L A N D

ANTI-GLARE: The ribbed curtains stay where they are put and really do exclude cloud-glare and sunlight for the sleepy passenger.

ROOM TO STRETCH: The de Havilland chairs, having no rear pillars, leave plenty of leg room for the tallest passenger.

VENTILATION: There are eight individually adjustable cold-air louvres. Hot-air ventilation is controlled by the crew.

SMOKING: Dove design meets all smoking regulations and each chair has its own ash-tray recessed into the wall.

MULTUM IN PARVO: The Dove is a small aeroplane, but skilful design has made the most of the space available. Comfort, elbow-room, airiness, silence and freedom from vibration attain a standard normally associated with larger liners.

Standards of passenger comfort approaching those of the trunk routes are now available for the world's tributary airlines

D O V E

DH AIRCRAFT · DH ENGINES · DH PROPELLERS

HATFIELD · HERTFORDSHIRE · ENGLAND

Safety . . .

The **MILES MARATHON** is the first British aeroplane designed to meet the P.I.C.A.O. safety requirements.

ON FOUR ENGINES AT 5,000 FT.

At full load the rate of climb is 1,300 ft./min. on maximum power, and 970 ft. min. at tne rated power. The latter is nearly DOUBLE the P.I.C.A.O. requirement, and illustrates the suitability of the MARATHON for operation in tropical climates, and from high altitude aerodromes.

ON THREE ENGINES

The maximum rate of climb with the critical engine stopped is 700 ft./min., and at rated power 450 ft./min. This is THREE AND A HALF times the performance required by P.I.C.A.O.

ON TWO ENGINES

The maximum rate of climb is 160 ft. min.

WITH BOTH ENGINES STOPPED ON ONE SIDE

Even in such an emergency the MARATHON can still climb at full load. Moreover, in this condition the machine can be trimmed to fly with both hands and feet off the controls.

Incidentally

The MILES MARATHON is the ONLY British four-engined transport with tricycle undercarriage and other up-to-date features. It has "built-in" safety features including crashproof fuel tanks, full duplicated wheel brakes and high efficiency flaps combined with comparatively low wing loading. The cabin provides over 55 cubic feet per passenger with exceptional comfort and view.

MILES AIRCRAFT LIMITED · READING · ENGLAND

HERE AND THERE

North of England services have reported a certain amount of icing on some journeys, but nothing very serious.

The only appreciable interference with the English Division network has been in the south where, at Bristol, Cardiff and Croydon the grass airfields became waterlogged, resulting in some cancellations.

New Labs

NEW research laboratories at Boreham Wood, with a floor area of 50,000 sq ft, have been set up by Elliott Brothers (London), Ltd., the old-established specialists in measuring instruments and specialized equipment.

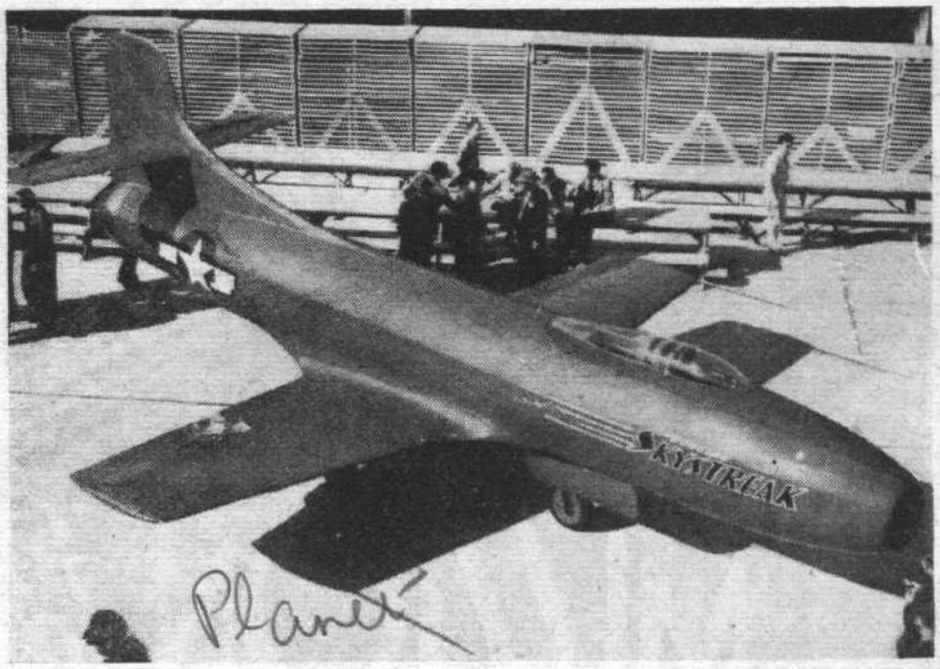
The new organization will be in the charge of Mr. J. F. Coales, O.B.E., M.A., M.I.E.E., who was, from 1930 to 1937, engaged on research for the Admiralty Signal Establishment into radio direction finding. Throughout the war he was responsible for the development of all gunnery radar in H.M. ships.

P.R.O. Changes

E. A. ("CHRIS") WREN, whose highly individual caricatures of aircraft are internationally acclaimed, has joined the S.B.A.C., as press relations officer, in succession to James Stanton, whose chief occupation will now be public relations director for the Lockheed Aircraft Corp. in the U.K. and Europe.

Mr. Wren had pre-war experience as a commercial artist and writer and joined 604 Squadron, A.A.F., in 1932. During the war he specialized in aircraft recognition training and was Recognition Training Officer to Combined Ops. before and after D-Day. He transferred to Intelligence for a period and in July last year took over the editorship of the Inter-Services Aircraft Recognition Journal, which post he retained until his demobilization early this year.

In his new job Mr. Stanton has already left for a three weeks' visit to Europe.



SKYSTREAK : One of the two new Douglas Skystreak transonic research machines. Built for the U.S. Navy the aircraft shown is alternatively designated D-558. A General Electric TG 180 axial-flow turbine jet is fed through a bifurcated duct from a nose intake. The wing area is 150 sq ft; wing loading 65 lb/sq ft (55 lb/sq ft at landing); span 25ft and length 35ft 1½in.

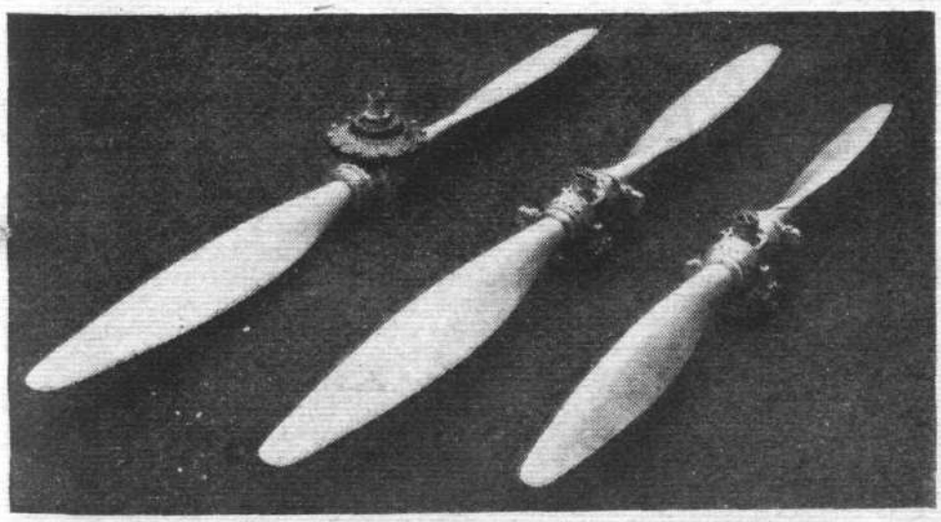
SPINNING TRIALS COMPLETED

THREE new types of metal airscrews produced by the Fairey Aviation Co., Ltd., have recently passed their spinning trials at the R.A.E. All three are of the two-blade controllable-pitch variety with electrical or mechanical control.

The Gyrodyne airscrew, which will be in the starboard stub wing of the Fairey helicopter, is of 7ft diameter and weighs, complete, 70 lb. This airscrew will provide most of the forward thrust for the Gyrodyne and will have electrical pitch control.

The larger of the other two is also 7ft in diameter but weighs only 45 lb. The smaller, which is designed for use with engines of the Cirrus Minor capacity, weighs but 37½ lb and has a diameter of 5ft 9in. Later models of these are to be adapted for both electrical and hydraulic pitch control.

Prototype airscrews are still in the course of 100-hour bench tests.



NEW FAIREY AIRSCREWS : On the left is the model specially designed for the Fairey Gyrodyne, the other two are for light aircraft. Some details of size and weight appear above.

In Brief

COL. JOHN MANBY, O.B.E., I.A., has been appointed public relations superintendent for British European Airways. During the war he was, in addition to other activities, Inspector of Welfare for all Indian troops and Controller of Indian E.N.S.A.

* * *

Red Star, the Soviet military newspaper, claims a world's record for Col. Romanyuk, who celebrated his 1,500th parachute jump by making it from the stratosphere. No exact height is quoted. Oxygen apparatus was carried but only a standard parachute was used.

* * *

Denis Dickson has recently been appointed general manager of Southampton Air Services, Ltd. He has been flying for over twenty years and during the war did a lot of test flying, latterly with the Fairey Aviation Co., Ltd.

* * *

Mr. A. McVie, B.Sc., has been appointed commercial director of Standard Telephones and Cables, Ltd., in succession to Mr. C. W. Eve, who is retiring.

* * *

The Canadian Defence Minister, Mr. Brooke Claxton, has announced the establishment of a school at Rivers, Manitoba, for instruction in airborne operations.

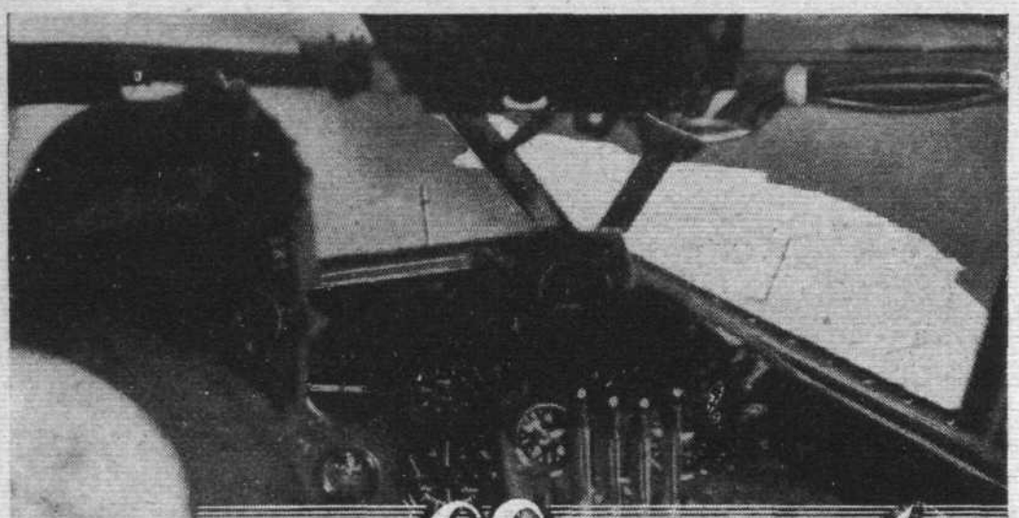
* * *

Mr. D. C. de la Cour has recently been appointed technical sales representative of the aircraft division of Automobile & Aircraft Services, Ltd., at Byron House, 7-9, St. James's Street, London, S.W.1.

* * *

F. W. Haywood, Ph.D., B.Sc., F.R.I.C., D.L.C., F.I.M., has been appointed to the board of Wild-Barfield Electric Furnaces, Ltd., Watford, Herts., as Technical Director. Dr. Haywood joined the company in 1938 as chief metallurgist, and has been responsible for numerous important developments.

Fairey pic HPI. 2586



MISSION to INDIA

Part II—The Outward Journey : Thoughts on Non-stop Flying: Navigational Facilities : Desert and Yet More Desert

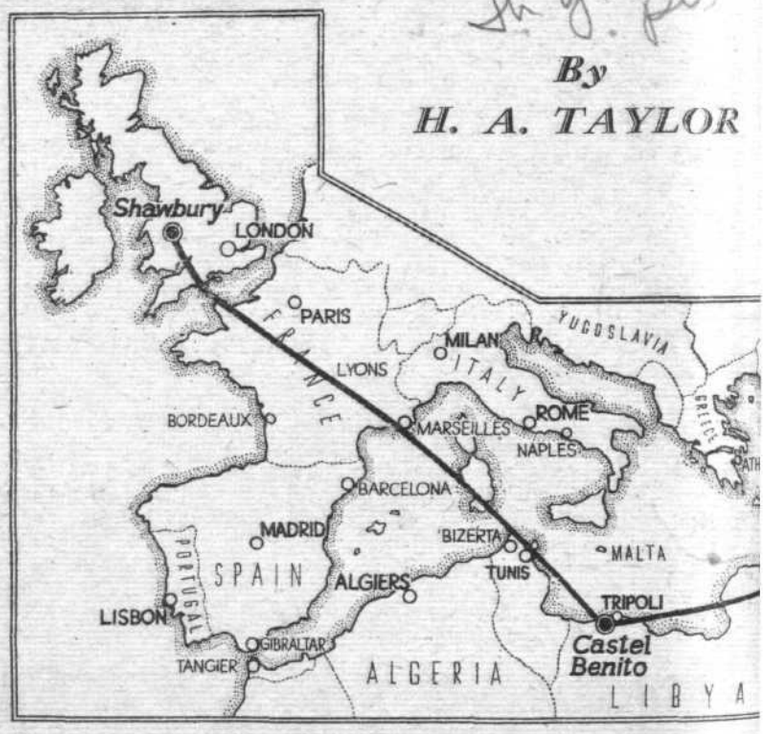
By
H. A. TAYLOR

IN all honesty even the most enthusiastic air traveller will admit that long-distance non-stop flying is quite one of the more tiring and even boring means of transport unless one is in some way concerned with the conduction of the affair. Since our start from Shawbury had been so delayed, the need to press on was all the greater and the Powers-That-Be had, in any case, given us our route and stopping points—from which no deviation, other than in case of emergency, was to be permitted. So far from enjoying the privileges of the self-contained and free flying unit, able to drop in anywhere according to our fuel state and whims, we discovered something of the thoughts which might pass through the mind of the long-distance airline passenger. Castel Benito (Tripoli), Lydda (Palestine) and possibly Shaibah were our fixed points of call—other possible landing points having been considered to be altogether too busy to accommodate a large and thirsty aircraft and equally large and hungry crew.

The Question of Stages

To some degree our route resembled that used by the B.O.A.C. Lancastrians on their high-speed run to Australia—though they make Lydda non-stop from this country. One thing I decided without a shadow of doubt; excellent though it might be to reach India in 30 hours and Australia in 60 hours, no one in his right mind would make such a necessarily limited-stop journey unless time-saving was of vital importance. Far better to do the trip in easier stages with longish night and other stops during which the legs can be stretched and something seen of the world at large. Given the choice I would always travel by stages of not more than five hours or so at a time. The most comfortable seats become cramping after that period of time, and the desire to get up and to walk briskly about becomes almost a mania.

Furthermore, even when flying at moderate heights of eight to ten thousand feet the mild shortage of oxygen is felt and the muscles consequently tire more readily than they would otherwise do. In fact, I would suggest to the airline operators that the installation of oxygen equipment and the arrangement of its steward-organized use for an hour or two at a time on any stage longer than five hours would be a good thing unless the average height maintained on the flight is lower than five thousand feet. Which, with the need for maintaining safety-height over most stages, is hardly likely to be feasible.



The route from England to India flown by the E.A.N.S. Halifax.

Part I of "Mission to India" dealt with the Handley Page Halifax in which our representative flew, and also with the special navigational equipment carried in the aircraft. In this issue the outward journey to the East is described in detail and the effects of flying long stages at near oxygen altitude discussed. Part III, in our next issue, will describe the Mission's journeyings in India and the various stations visited.

Another point is that guest houses, on or near the terminal airfields, should be planned and used whenever possible. Uninteresting though it might appear in previous consideration to be so restricted in one's movements at the terminals, nobody, after a day's hard flying, reacts well to the luggage-checking and to a possibly long ride in a doubtfully comfortable transport to the nearest town. The mental effect of knowing that one has actually arrived when one has landed, and that one's belongings cannot at any time have strayed further than the airfield boundary is an immensely relieving one. An early start is, too, more easily arranged and effortlessly made.

After an abortive start in the pre-dawn light of a mid-January morning, during which the Halifax iced up quite heavily even while taxying out to the

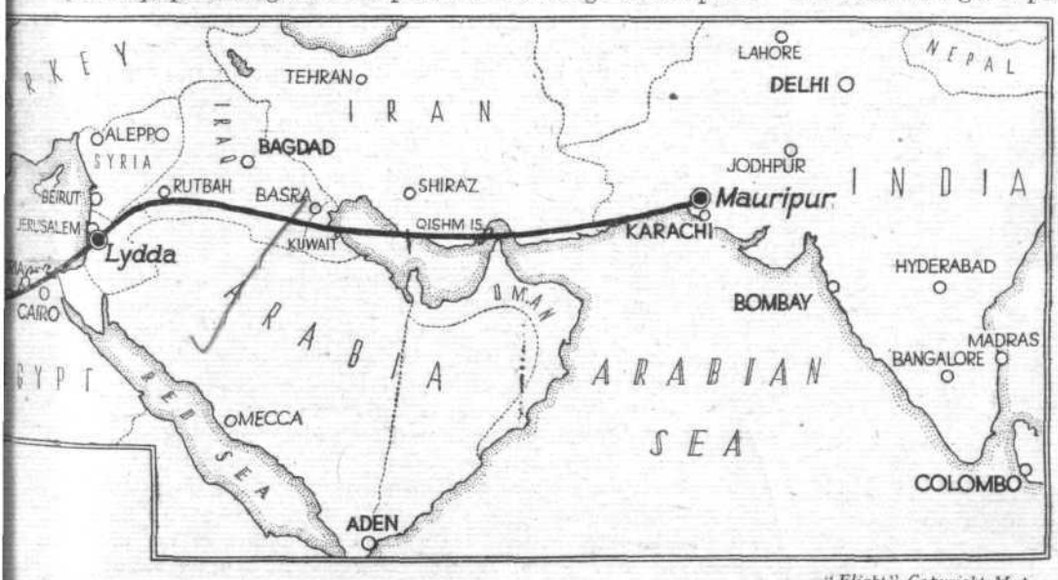
"Flight" photograph.

Refuelling at Castel Benito. Two tankers simultaneously top-up the Halifax' normal and bomb-bay overloads to maximum capacity for a projected (and later cancelled) non-stop run to Shaibah at the head of the Persian Gulf.

take-off point, we finally became airborne when the ground mist partially cleared at mid-day on January 19th. We had been routed by Overseas Aircraft Control, Gloucester, via Portland Bill and Istres, near Marseilles, and, as it happened, the thin ground mist layer which covered the whole of the Midlands broke up before the Cotswolds had been reached, and thereafter, until darkness fell beyond the French Mediterranean coast, the flight was made by normal contact means.

Nevertheless, there were plenty of opportunities during the first four hours of checking the various items of navigation equipment against the positive knowledge of our positive rosy glow in the setting sun, are not far enough away to be ignored during any night or bad weather flight southward. We used our Rebecca equipment to home on the Eureka beacon at Istres, and were thereafter dependent on plain navigation and the assistance of the H2S scanner.

Off the west coast of Sardinia, when darkness was complete, one of the three navigation instructors provided himself with some practice in sextant work and, using Betelgeuse, Capella and Polaris, obtained a fix which, when plotted and checked against the H2S picture, proved to be correct within the limitations of astronomical navigation. The little triangle of position lines, small though it appeared on the plotting chart, covered an area of a diameter of about ten miles. The H2S again proved useful when crossing the first part of the North African coast near Cape Bon, where we were on track, and ordinary QDMs were obtained from Castel Benito when we were some 150 miles away.



"Flight" Copyright Map.

It is always exciting to see for the first time by daylight a new world into which one has landed in complete darkness. Castel Benito, on the following morning and after a night in a transit camp which had been originally built by the Italians as a rest camp for their Air Force, proved to be the vast sandy area expected, but was surprisingly bounded by quite a number of trees. The only signs of war were the innumerable machine-gun and/or shrapnel holes in the massive doors of the hangars. Castel Benito is still used by Air France and Sabena on their African runs, but B.O.A.C. no longer call; at the time of our visit there was a smallpox scare in Tripoli, and we were confined to the camp area for the few hours of our stay.

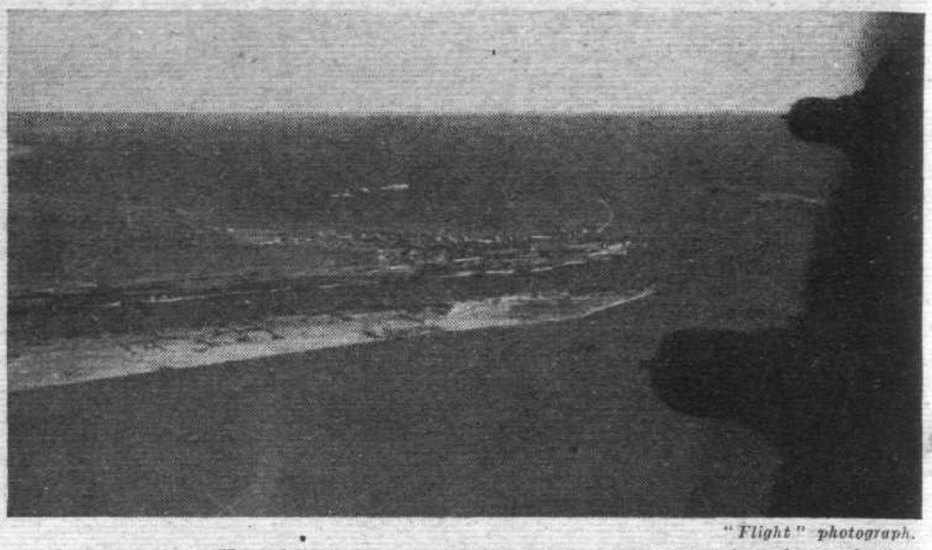
This stay was originally meant to last throughout the day and to be followed by a night flight to Shaibah, but the meteorological story became a little less terrifying before mid-day and we finally decided to make Lydda, Palestine, the same day. Once again daylight failed long before our arrival at the terminal, and impressions of Cairo and the Nile Delta were confined to the somewhat unimaginative pictures to be seen on the P.P.I. of the H2S. Comforting though these were, they did not indicate that amazing metamorphosis from complete desert to concentrated

tion obtained by simple map-reading. The compass orientation of the H2S, for instance, had not been adjusted for the very good reason that the first test flight was made only on the day previous to the start of the trip. The Gee equipment was, however, working well, and two accurate check fixes were obtained over the Bristol Channel and another when south of Cherbourg. Provided that no mistakes are made in the initial "counting," Gee certainly provides absolutely clear and unmistakable pin-pointing in any conditions. The sun was setting as we passed over the Auvergne Mountains, and one realized then how, even with the help of the Rhone Valley, difficulties could be experienced in any contact flight to the South of France. The Central Massif rises to something like 6,000 ft on the straight line from Cherbourg to Marseilles, and even the Alps proper, which stood out to the east with that distinc-

MISSION TO INDIA

vegetation which is met while flying along the coast near Alexandria.

Since the start from Lydda—where everybody but ourselves walked about armed to the teeth—was made on the following morning very soon after dawn, and the last daylight of the previous flight had shown nothing but the expanse of the Libyan desert, the impression gained was a comparatively correct one that, along the thousands of miles between Tripoli and the centre of India, there is hardly a green tree or a patch of green grass to be seen. It is amazing, in fact, that so very much of the world has become as barren as the surface of the moon, and that so many thousands of human beings manage, somehow, to scratch a living out of the nothingness.

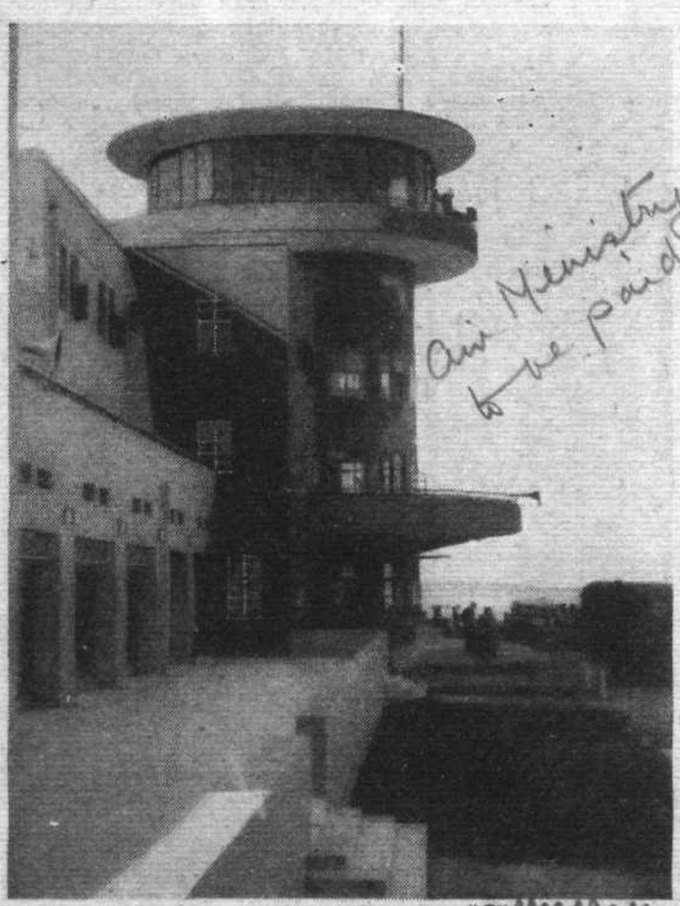


"Flight" photograph.

The entrance to Karachi's harbour. "It is good to look at by night, when only the twinkling lights of the city and the harbour can be seen."

For various reasons the eastward flight from Lydda consisted first of a stooge along the pipeline to a point west of Rutbah, where we set course for Shaibah—with every intention of by-passing this unhappy spot if the fuel state appeared still to be reasonable. In fact, after obtaining QDMs from Habbaniyah and Shaibah, we passed by on a track some twenty miles south of the latter, reaching the Persian Gulf at Kuwait. Here is the perfect example of the comparatively large city based, apparently, on nothing but trade and sea fishing, since as far as I could see from the air there was no sign even of the bare possibilities of any form of agriculture.

Those who look at a map of the world probably view the Persian Gulf as a little estuary across which one can take an Auster in the matter of an hour or two. In point of fact, and even at a cruising speed of some 200 knots, one is out of sight of land for two to three hours, according to the track chosen, and except, perhaps, for one or two sailing boats, and maybe, a motionless tanker, the Gulf is without sign of life. Some of our very best H2S presentations were obtained at the entrance to the Gulf, over Qishm Island. The whole of the north side of the Gulf as well as the smaller islands to the south of the main island, with thirty miles of the peninsula of Oman and the Pirate coast, showed up bravely—not to mention a couple of otherwise uncharted specks on the P.P.I., which were optimistically claimed to be fishing boats since there were no islands to be seen in their relative position on the chart. More H2S fixes were obtained during the dark off the coast of Baluchistan, with QDMs duly obtained from Jiwani. During a flight eastwards the loss of time and daylight is quite extraordinarily marked. There is a difference of 3½ hours in the official time in Palestine and India—which means, in effect, that one has lost that amount of valuable daylight.



"Flight" photograph.

Lydda's terminal building is a singularly impressive one. This airport is used on the very fast limited-stop B.O.A.C. run to Australia.

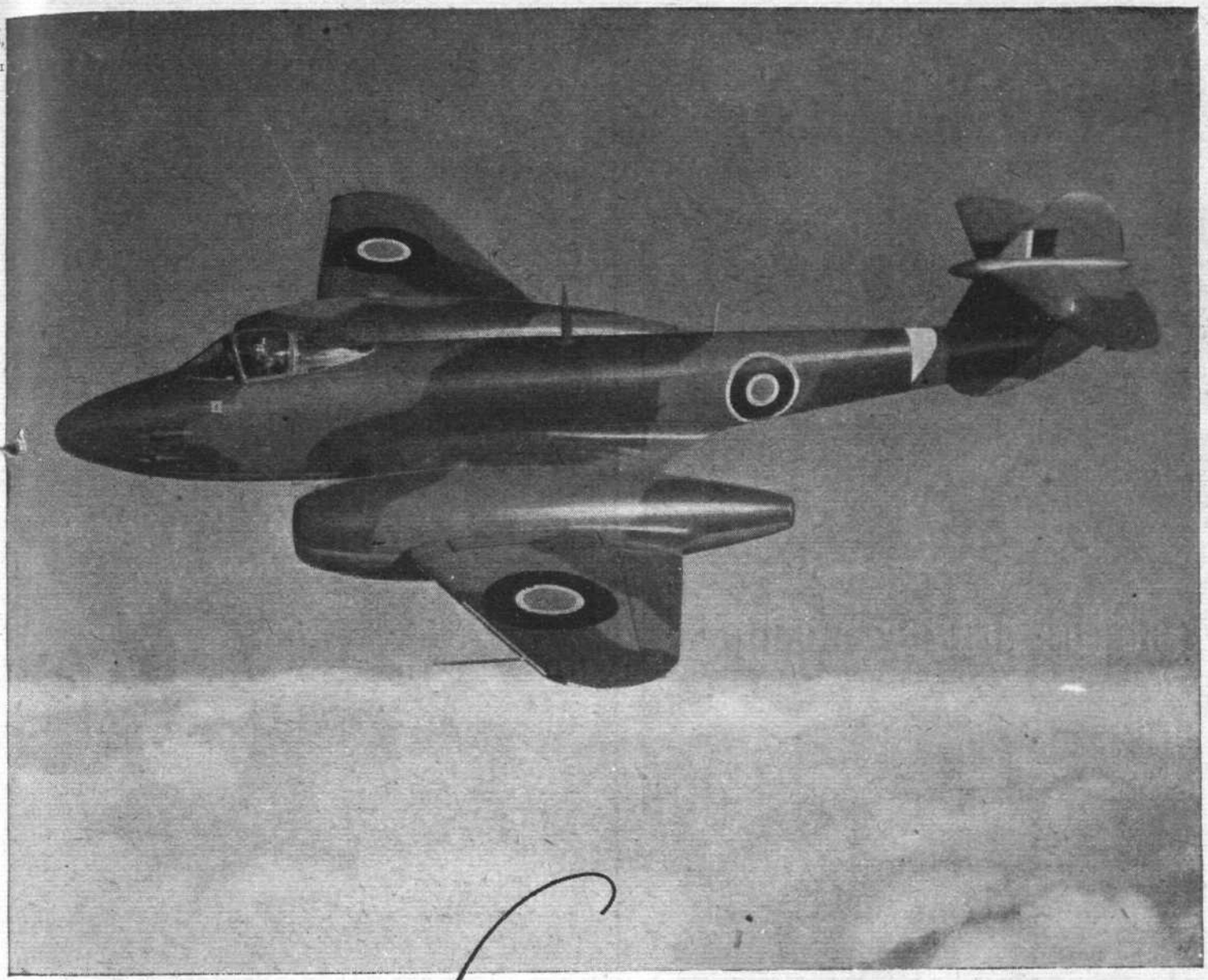
Mauripur, the Karachi airfield at which we landed, is to the north west of the city, while Karachi Airport is to the south. At one time during the war there were something like a dozen airfields in the Karachi area. Whether or not civil services will always be concentrated at the official airfield remains to be seen, but Mauripur has usefully long runways and a Transport Command terminal building of standard type and considerable merit. More important still, there is, nearby, a transit mess which was originally built, one gathers, for the use of those ubiquitous people, the V.I.P.s The accommodation in this mess is certainly quite good enough to be offered to any fare-paying airline passengers.

To the ignorant and casual onlooker Karachi is yet another of those bleak cities for which there appears to have been little original justification. Presumably it lay conveniently on the trade routes between the Near East and India, but, from the air traveller's point of view, it is merely a city poised between the inhospitable coast of Baluchistan on one side and the limitless Sind desert on the other. But it is good to look at by night, when only the twinkling lights of the city and the harbour can be seen.

(Part III will appear in next week's issue.)

FORTHCOMING EVENTS

Mar. 14th.—R.Ae.S, Graduate and Student Section, London: "Development in Propellor Turbine Engines," G. J. C. Davies.
Mar. 19th.—Royal Aero Club: Annual General Meeting 6 p.m.
Mar. 19th.—R.Ae.S. Southampton: "High Speed Flight." R. Smelt. M.A. A.F.R.Ae.S.
Mar 19th.—Presentation by Lord Brabazon of the Britannia Trophy to G. C. Donaldson.
Mar. 21st.—Association of British Aero Clubs 1st Annual General Meeting, Londonderry House, W.1.
Mar. 21st.—United Flying Club's Ball, Dorchester Hotel, W.1.



fastest aeroplane in service today

GLOSTER METEOR

ROLLS ROYCE DERWENT ENGINES

GLOSTER AIRCRAFT (BRANCH OF HAWKER SIDDELEY AIRCRAFT CO., LTD.)

HUNTING AEROSURVEYS

Multi-purpose Air Photography : World-wide Organization : Extreme Accuracy Achieved

PHOTOGRAPHY from the air, which played such a big part in the defeat of our enemies, is now the accepted form of mapping. Huge areas all over the world are being accurately charted in a fraction of the time taken by the older and much more tedious ground methods. With special equipment, such as has been installed by Hunting Aerosurveys, Ltd., it is possible to produce plans up to a scale of 1/1,250 and show accurate 5ft contours on these.

Revision of existing Ordnance Survey maps is one of the most important undertakings, but town planning, estate and factory layout, traffic control, car parking, engineers' maps, land utilization, geological survey and forestry all have their particular applications. A considerable amount of air photography is also done for catchment boards for river control, and even seaweed surveys are made so as to ensure economical gathering. Seaweed beds can be identified in air photographs to a depth of 30ft.

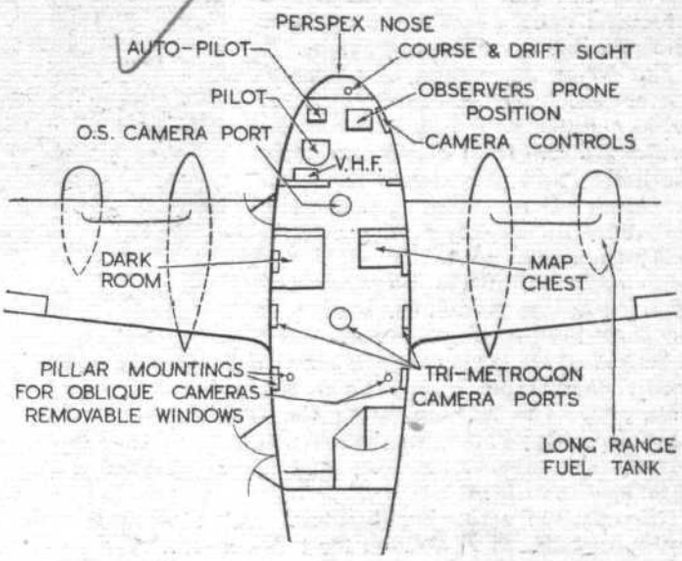
Aircraft Employed

At the moment three types of aircraft are being employed. For low oblique photography, that is to say, for factories, estates and suchlike targets, Austers are used. The excellent view and slow speed make this type eminently suitable for this work. The roominess of the cabin in such an economical aircraft is also an advantage.

Survey contracts in the United Kingdom are flown by a Percival Proctor which has a Williamson Eagle IX Vertical camera fitted, and for surveys abroad there is a D.H. Rapide employing one of the new Williamson O.S.C.-1 cameras. This aircraft at the moment is engaged on a contract in Arabia. The O.S.C.-1 incorporates almost every modern feature. It is enclosed in a transparent dome, and heat is led into this dome and also through the body of the camera, in order that an even temperature can be maintained at all heights. The magazine contains sufficient film for 500 exposures without changing. (The O.S.C.-1 camera was fully described in *Flight* of July 26th, 1945.)

For covering the huge areas which have to be mapped abroad a very stable aircraft of long endurance is necessary, and as soon as the Percival Merganser becomes available, it is the intention of Hunting Aerosurveys to have one or more specially equipped for aerial photography. A general-arrangement drawing of the layout which appears on this page shows the adequate space available for all the necessary gear and equipment.

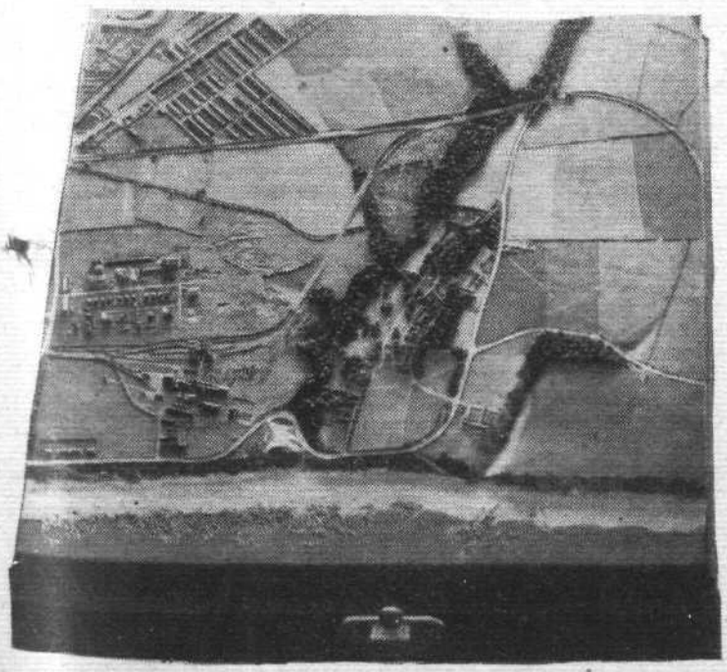
Air mapping is no longer a simple business of plotting details from air photographs on to existing maps requiring revision. A lot of this work is still done, of course, but



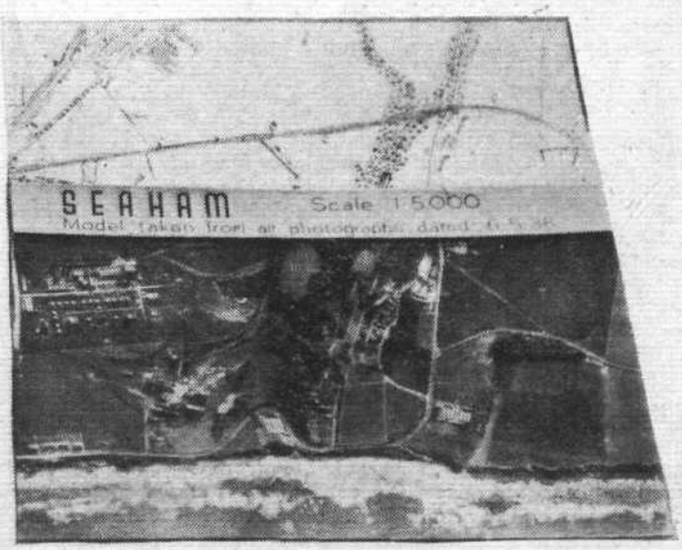
Cabin layout of the Percival Merganser for employment as an air survey aircraft.

for accurately contoured plans of hitherto unmapped territory, complicated stereoplotting machines are employed.

Pairs of photographs, with 60 per cent overlap, are put into the Wild A.5 stereoplotter in the relative positions they were in when taken and, starting from ground control points checked by theodolite, it is possible to put in the contours over the whole area. The system employed is one of optical triangulation, the angles altering according to



Below is a portion of the existing map of Seaham with a 1/5,000 air photograph superimposed over the lower half. On the left is a model of the same area made from the new photographs. It is so accurate that even the fence heights are to exact scale.



Central Press

HUNTING AEROSURVEYS

the apparent rise or fall of the ground as seen through the binocular eyepieces by the stereoplotter operator.

After pre-setting to a ground control, all the operator has to do is to keep two black dots, which represent rays of light emanating from the centre of the area under examination, in superimposed register, to find the exact height of any spot appearing in the stereogram presented by the two adjacent photographs. Actual heights are read-off from a scale, and an accurate contour can be recorded by an automatic pantograph if the operator follows a line of unvarying height.

The Wild Autograph A.5 stereoplotter used by Aerosurveys is of Swiss manufacture and of exquisite workmanship. It works to extremely fine limits, and provision is made for correction of any slight inaccuracies caused by the photographing aircraft flying other than level.

Incorporated in Hunting Aerosurveys, Ltd., are Aerofilms, Ltd., and the Aircraft Operating Company—two of the oldest air survey concerns in the world. Associated companies in the Empire are the Air Operating Company of Africa; Photographic Survey Company of Canada; Adastra Airways, Australia; and New Zealand Aerial Mapping Co., Ltd.

Recently the managing directors of each of these companies forgathered in London for a conference. Visits were paid to survey departments and aircraft and equipment manufacturers. Contracts Huntings have on hand show the varied purposes for which air survey is now being used. Some of these are: 1,800 sq miles in Nigeria for tin winning; 7,800 sq miles in Arabia for oil; 4,250 sq miles in Persia for oil; 125,000 sq miles in Ontario for timber stocking; 9,000 sq miles in Venezuela for oil; 12,800 sq miles in Colombia, S. America, for oil; 50,000 sq miles in State of Victoria, Australia, for mapping.

Representatives of Hunting Aerosurveys, Ltd. and associated companies inspecting the Merganser. Left to Right. F. L. Wills (Hunting Aerosurveys) P. L. Hunting (Hunting Aviation Group) F. W. Follett (Adastra Airways) D. N. Kendall (Photographic Survey) H. P. Van Asch (New Zealand Aerial Mapping) and Col. C. R. Robbins (Aircraft Operating Co. Africa).

FLARES AND ROCKETS

AT Dunsfold airfield recently Schermuly Pistol Rocket Apparatus Ltd., of Newdigate, Surrey, gave a display of aeronautical pyrotechnics. It was very well attended, British and foreign Services and Ministries, and representatives of aeronautical interests of no fewer than 18 countries being present.

The Schermuly Company invented and produced a number of special devices during the war, notably certain P.F.F. skymarkers and target indicators, "snow flake" anti U-boat flares and the kite launching rocket which will be familiar to many aircrew men (collect emergency radio and kite—action No. 5 for the rear gunner on dinghy drill, wasn't it?)

The demonstration started with 1in and 1¼in Very cartridges which were intensely bright and pure in colour. Next were shown rocket parachute hand signals which can be used to replace Very lights when greater brightness or range, and slightly longer burning periods are required. These would be useful for airfield control in very poor visibility or for signalling to searchers the position of an aircraft which had force-landed. They are light, compact and effective, but the parachute seemed rather unreliable.

Examples of a number of parachute illuminating flares for emergency landings, remotely fired from the ground or dropped in pairs from an aircraft were demonstrated. The 10½lb projector parachute illuminating flares of 400,000 candle power were particularly effective, and by the light of two or three, a visual landing could be made at night without undue difficulty, on land or water. They burst at about 1,200ft and while descending burn for some 80 seconds giving a warning by means of a single red star dropped after 60 seconds, when a replacement rocket should be fired.

In addition to the kite launching rocket and line throwing pistol rockets, 7-minute burning (there are also 14- and 4-minute versions) ground landing flares were shown. These burn very brightly with sodium colour and might be very useful in near-emergency fog conditions to assist an aircraft on the approach by augmenting an existing sodium funnel or taking its place. They are remotely set off and can be laid very quickly. As a flare path they appear to be very dazzling, and screens placed on the down-wind side would be advisable, if not essential. For the same reason sodium lamps are usually turned 45 deg "upwind" away from a landing aircraft.

A Schermuly direct quick-action foot-warmer would have been appreciated at Dunsfold.

P. AND W. GAS TURBINE RESEARCH

AN interesting story lies behind the building of a new gas turbine research and development laboratory near their present plant at Hartford by the Pratt and Whitney Aircraft Division of United Aircraft Corporation.

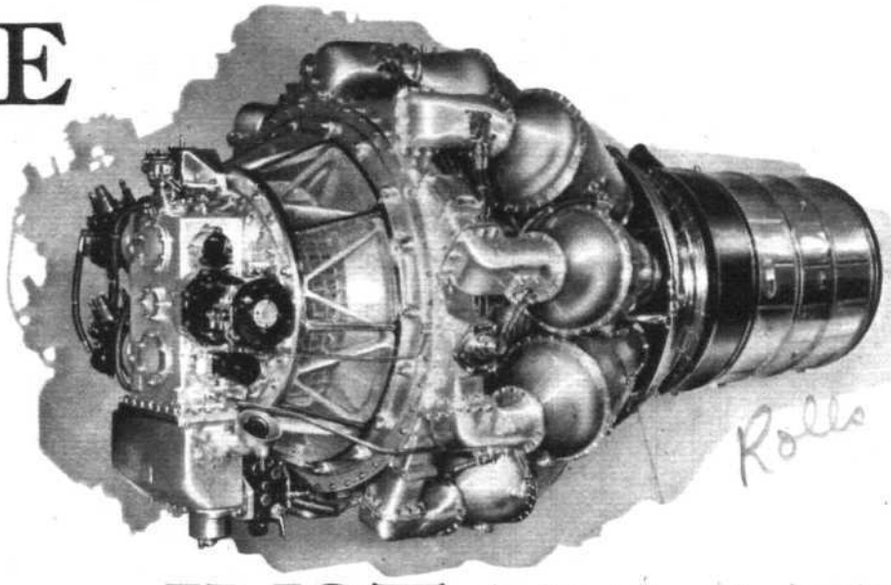
Much of the power equipment for one of the two main sections, the compressor test laboratory, was obtained from H.M.S. *Bligh*, a surplus lease-lend destroyer escort returned to the U.S. Navy after the war. In the power plant area of the new laboratory will be installed virtually all the *Bligh's* propulsion equipment, which includes two marine boilers, two main and two auxiliary turbo generator sets. These will be in much the same relative positions formerly occupied in the *Bligh's* forward and aft engine rooms. As a result it has been possible to salvage and use piping and other connections.

The adoption of this ship propulsion equipment, the high horse-power of which makes it ideally suited for turbine test work, will make the laboratory available much sooner than would otherwise have been possible. This may suggest similar possibilities to British companies.

The test section will house two test cells, each containing a 5,500 h.p. electric motor with an over-speed rating of 7,500 h.p. and it will be possible to simulate widely varying atmospheric conditions; limit figures being an altitude of 40,000ft, temperatures of minus 70 deg. F. and speed effects of 500 m.p.h.

In their announcement the company states: "For some time preceding the war Pratt and Whitney was conducting research work on the gas turbine as an aviation power plant." We imagine that if a report were made on this pioneer work it would not be exactly voluminous.

NENE



INSTALLATION

Details of Rolls-Royce Gas Turbine Power Units in a Lancastrian

ALMOST every authority on jet propulsion seems to have found time during the last year to deliver a lecture on gas turbines or their applications. Each one discussed the high-speed high-altitude requirement for economy, and while some foresaw the operation of jet passenger services within a year or two, others more guardedly spoke of five or more years.

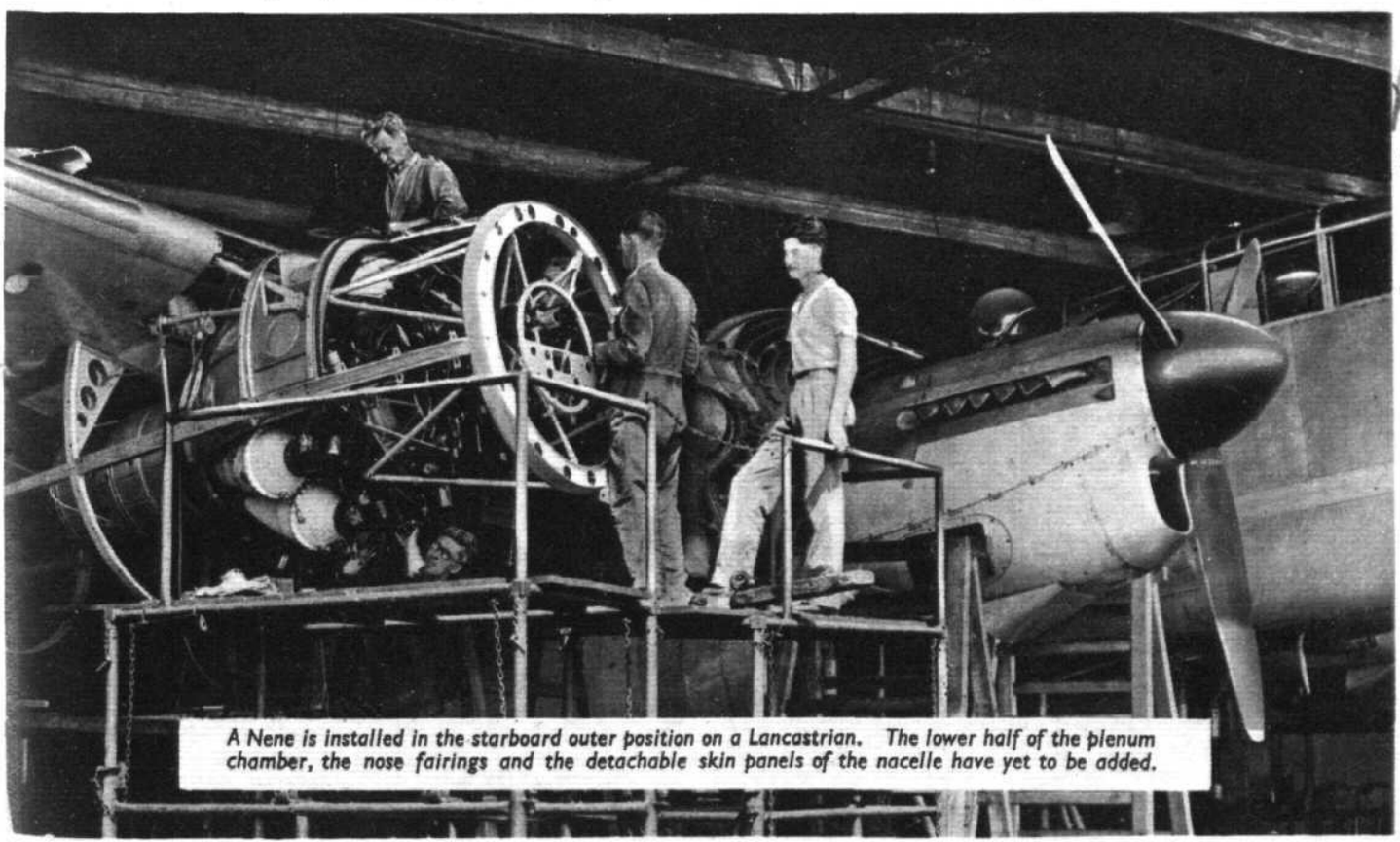
One important fact now emerges, namely, that most of the more optimistic speakers are modifying their ideas and that as we slowly learn more of high-speed flight at 30,000ft and above, the problems appear more complex rather than less. It is disappointing that there is so little apparent progress in this or other countries in the design of large high-speed high-altitude airliners of the class we had expected to see in service by 1950. Many major problems have yet to be solved, and in the case of the jet airliner there is no accumulation of experience with military counterparts on which to draw.

Looking for a moment on the brighter side, the following facts stand out: small pure-jet military aircraft are providing valuable information on the operation of gas-turbine power units. They are also providing designers with practical information on wing design. In addition, engine manufacturers have been able to increase the reliability of turbo jets and to improve to some extent the power and consumption figures. Finally, some progress has been made with cabin pressurization and air conditioning.

With the present limited knowledge of weather at high altitudes, and the lack of experience with cabin conditioning, passenger safety and comfort are now competing with purely technical difficulties as number one headache.

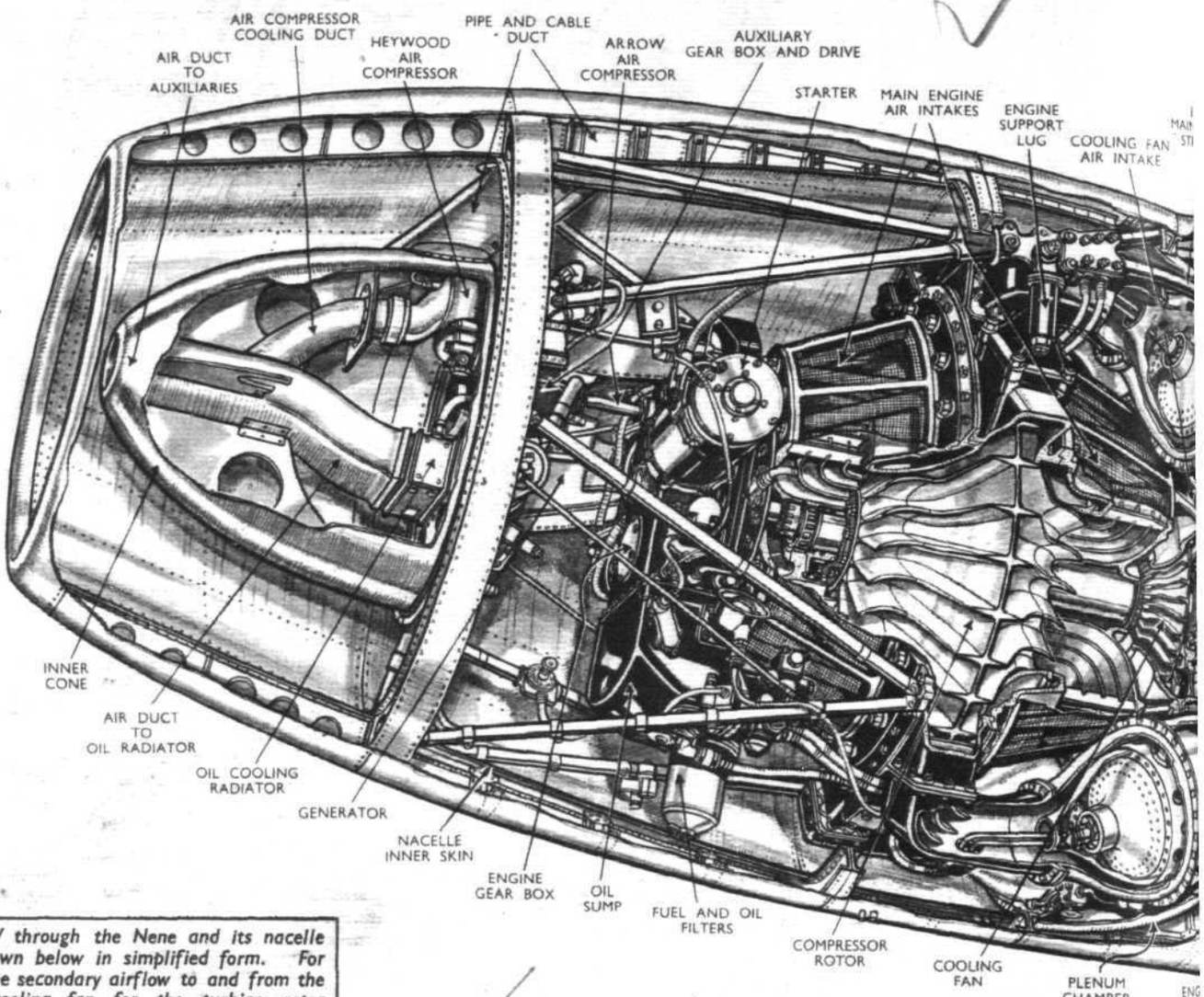
First Jet Transport

One important practical step taken some months ago towards the collection of operational data and experience with pure jets was the installation of two Rolls-Royce Nenes in the outboard positions on an Avro Lancastrian. Although the installation was made purely to flight-test the Nenes, the fact that the Lancastrian flies comfortably on jet power alone with its inboard Merlins feathered, that all essential accessories are duplicated on the Nenes, and that

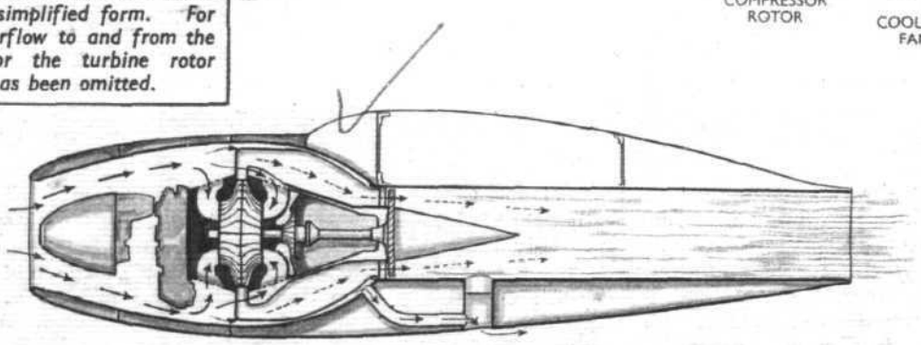


A Nene is installed in the starboard outer position on a Lancastrian. The lower half of the plenum chamber, the nose fairings and the detachable skin panels of the nacelle have yet to be added.

NENE INSTALLATION



AIRFLOW through the Nene and its nacelle is shown below in simplified form. For clarity, the secondary airflow to and from the central cooling fan for the turbine rotor and its bearings has been omitted.



the internal arrangements of the Lancastrian are unchanged, has meant that the aircraft can fairly be called the first jet-propelled passenger transport. What is more important is that a large number of people have been able to sample and study travel on a jet-powered aircraft while the Rolls-Royce Company proceed with their flight development.

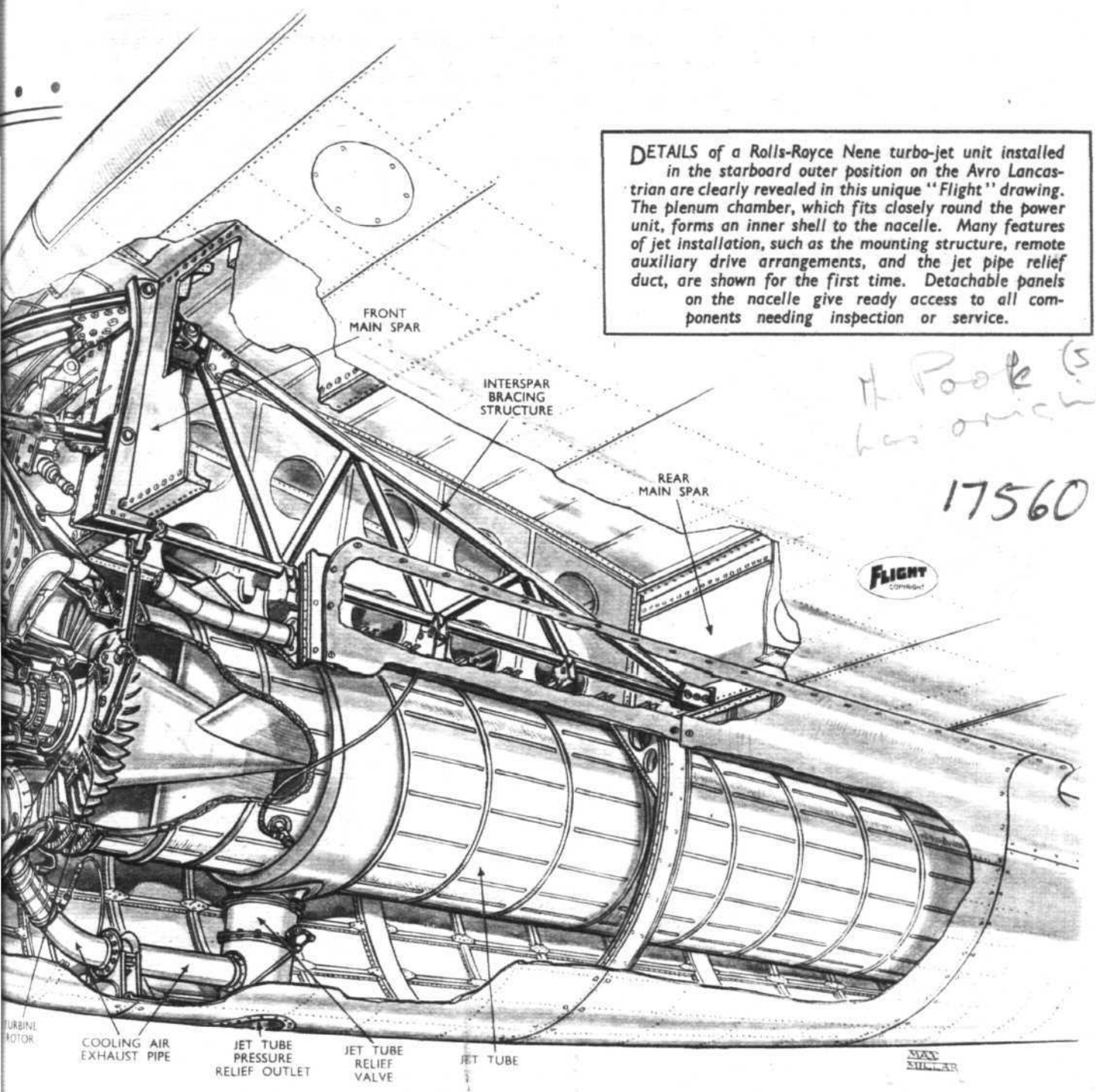
Most people will by now have read of the complete silence, except for the whistling of the wind, and the entire absence of vibration which characterize flight in the Nene Lancastrian. It is with the installation of these Nene engines that we are here concerned, and the comparative simplicity of these powerful units compared with the large-sized commercial piston engine is apparent.

On the Lancastrian, the Nene nacelles are underslung, and some modifications to the airframe were, of course, necessary. Each power unit is carried on two tubular structures cross-braced in plan and attached to trunnions on the engine diffuser casing. This supporting structure is in turn attached to sturdy vertical channel-section members bolted on the front face of the wing spar. Lining up with the channel sections are two inter-spar ribs which brace them to the rear spar and so help to distribute the load.

In addition to the main engine supports there are also two vertical tie rods between the front spar and the turbine casing, and the jet pipe is supported by two swinging links attached to wing trailing edge ribs. The original Lancastrian flaps and ailerons have been reduced in span by 40in and 10in respectively to give clearance for the jet pipes, and sections of the lower surfaces of the wings above the jet pipes have been covered by a thin steel sheet as a protection against the heat.

Cowling Supports and Formers

The cigar-shaped cowling is made up of an annular nose or intake section and a series of curved detachable panels behind it. The main circular former, immediately in front of the engine, supports the false spinner or inner cone and the remote accessory gear box. It is carried by tubular struts attached in four pairs to the main engine trunnions and to eye bolts around the diffuser casing. The struts spread forward in Vee form to the main former, which is



DETAILS *of a Rolls-Royce Nene turbo-jet unit installed in the starboard outer position on the Avro Lancastrian are clearly revealed in this unique "Flight" drawing. The plenum chamber, which fits closely round the power unit, forms an inner shell to the nacelle. Many features of jet installation, such as the mounting structure, remote auxiliary drive arrangements, and the jet pipe relief duct, are shown for the first time. Detachable panels on the nacelle give ready access to all components needing inspection or service.*

H Poole (524)
has original.

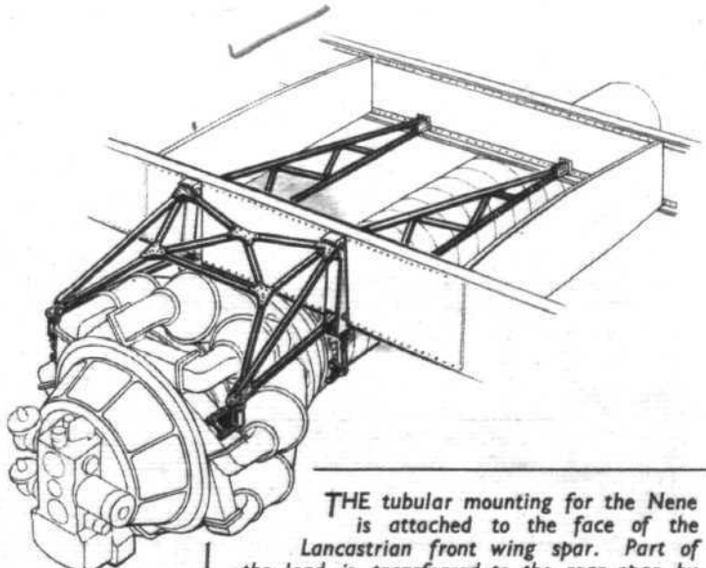
17560

in effect a front bulkhead. There are five other formers for the cowling, two in front of the spar and three behind it. In addition, two long channel members divide the structure horizontally on each side and carry fittings for the cowling fasteners. They are attached to the formers and to trunnions on the diffuser casing. The top inspection panels ahead of the leading edge are further divided on the fore-and-aft top line, and an additional channel member is provided at this joint.

The Nene itself is contained in a plenum chamber which is roughly funnel-shaped and of slightly greater diameter than the engine in order to allow sufficient air to reach the intakes to the rear side of the compressor impeller. Air is thus supplied evenly to the intakes on both sides of the compressor casing and is also free to circulate around the combustion chambers. The wall of the plenum chamber converges until it encircles the turbine casing and leaves only the jet pipe protruding. It starts as an inner nacelle skin, level with the front intake, at the second former from the nose, and is cantilevered back from the No. 3 former.

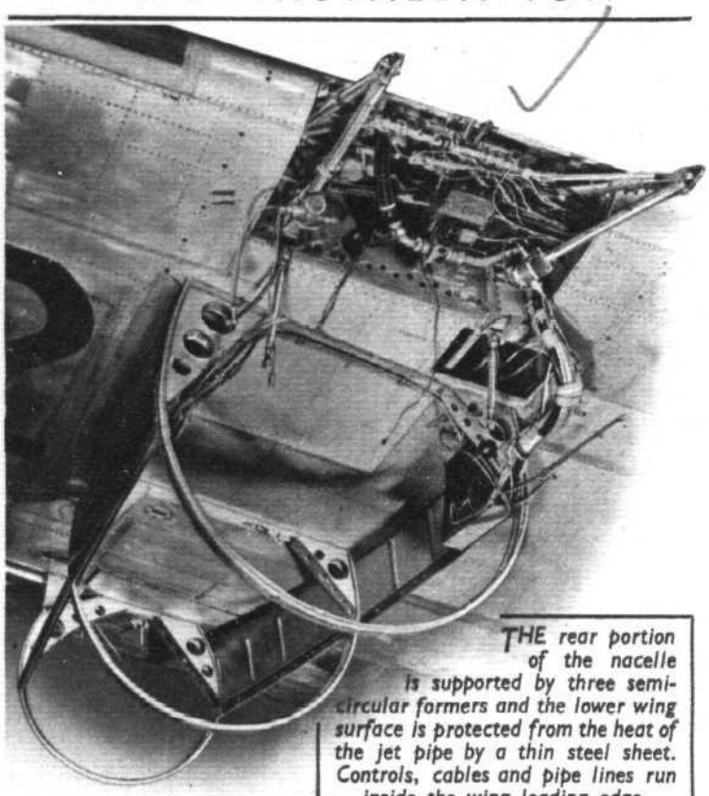
Port and starboard inner cones differ on the Lancastrian in that one contains a small air duct to supply the oil cooler and the Arrow and Heywood compressors. Details may be studied in the drawing. Above each cone is a streamlined duct carrying pipes and cables to the upper channel member of the cowling structure. This in turn leads them to the wing where throttles pick up the original Merlin runs to the pilot's levers. A detachable strip gives access to leads in the channel member.

A cooling air exhaust pipe is led from the lower portion of the plenum chamber to the jet pipe relief duct and thence to atmosphere. The relief duct and its valve are to aid in starting, the organ pipe effect of the long jet pipe being broken down when the ground mechanic holds open the



THE *tubular mounting for the Nene is attached to the face of the Lancastrian front wing spar. Part of the load is transferred to the rear spar by the interspar structures shown.*

NENE INSTALLATION



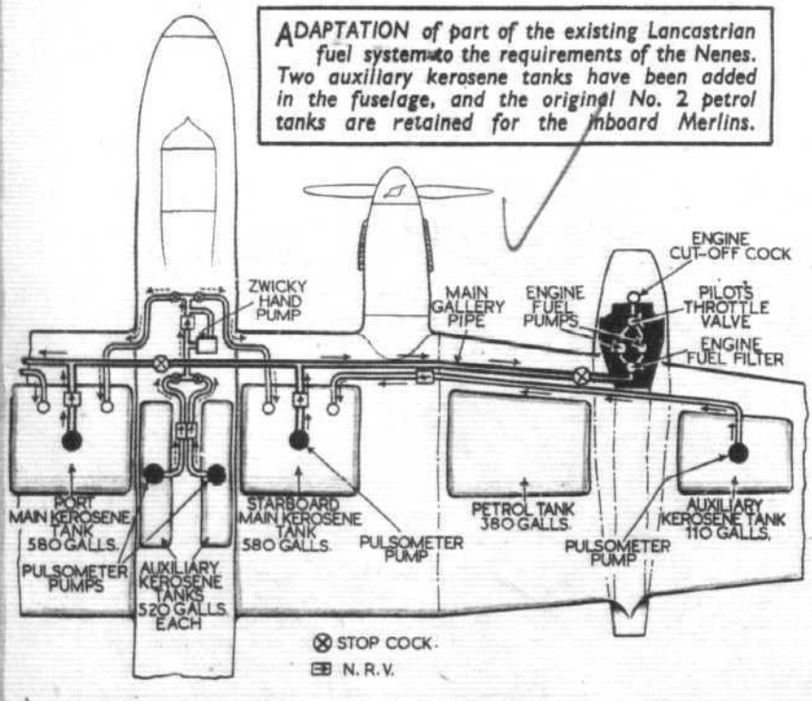
THE rear portion of the nacelle is supported by three semi-circular formers and the lower wing surface is protected from the heat of the jet pipe by a thin steel sheet. Controls, cables and pipe lines run inside the wing leading edge.

spring-loaded flap during the starting cycle. The duct leads down from the jet pipe just behind the turbine to atmosphere.

Fuel System

The fuel system for a gas turbine is of particular interest in view of the high maximum rates of flow and high operational heights. The modifications made to the Lancastrian petrol system are also of interest. In this case military requirements such as self-sealing tanks, inverted-flying valves, and provision for an inert atmosphere above the fuel in part-empty tanks, were not essentials, and the rearrangement of the Lancastrian system is most clearly shown by the accompanying diagram. Briefly the arrangement is as follows: The original No. 2 petrol wing tanks are retained for the Merlins. The No. 1 tanks become the main kerosene tanks for the Nenes, and the smaller No. 3 tanks, which feed into the No. 1s, are also used for kerosene. In addition to the normal six tanks, two auxiliary kerosene tanks holding a total of 1,040 gallons are carried in the fuselage. The total petrol capacity is thus 760 gallons, and the kerosene capacity 2,420 gallons.

ADAPTATION of part of the existing Lancastrian fuel system to the requirements of the Nenes. Two auxiliary kerosene tanks have been added in the fuselage, and the original No. 2 petrol tanks are retained for the inboard Merlins.



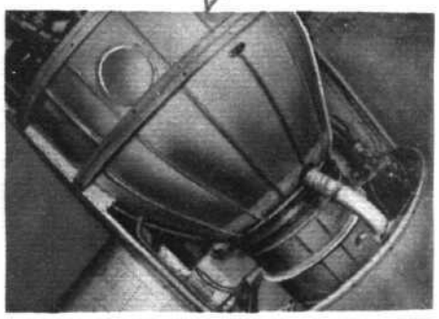
It will be noticed that, as is the case with the No. 3s, the auxiliary tanks also feed via pulsometer (or hand) pumps into the two main No. 1 tanks, and that the Nenes are supplied solely from them. In addition to the selector cocks, a main engine cock is provided in each case for maintenance and isolation in the event of fire. Inside the engine chamber, in the order of supply up to the burner, are the engine fuel filter, twin engine pumps, pilot's throttle control, and lastly, the high-pressure cut-off cock. To meet engine requirements, a 1¼-in bore pipe line to the low-pressure filter is recommended, and pulsometer pumps are essential to supply the fuel at a minimum of 6 lb/sq in. Correct mounting of the pumps is also important in order to avoid air locks at high altitudes, when considerable quantities of dissolved air and vapour are liberated from the kerosene.

Starting and Auxiliary Drives

The automatic starting cycle employed for Rolls-Royce gas turbines will already be familiar. It is customary to use 24-volt ground starting batteries for the starter, ignition coils and torch igniters.

Remote gear boxes are produced by Rotol, Ltd., and the drives rotate at 0.421 of engine speed. Three alternative forward-facing positions are provided on the engine wheel case—upper and lower horizontal and an upwardly inclined drive. For the Lancastrian, the upper horizontal position is used.

Air-heating jackets for the cabin hot-air supply can be provided, and for military installations gun heating could be arranged from the same source. Pressurizing connections for the cabin are found on some engines, but where a separate cabin supercharger is required it is mounted on the gear box. The choice of the source of air for pressurizing the cabin depends, to some extent, upon whether the aircraft is a military or civil type. If air is taken direct from the engine compressor, there is a risk of contamination; it may also restrict engine development in other respects. For civil purposes it is considered better to have a separate independent source of air for the cabin. The Lancastrian is heated (from the Merlins) but not pressurized.



THE wall of the plenum chamber closely follows the contours of the Nene and converges around the turbine casing. In this view from directly below, the cooling air exhaust pipe is clearly visible.

Installation connections are more numerous than might be expected, in view of the mechanical simplicity of the turbo-jet, but of the twelve, only two (the controls for throttle and high-pressure fuel shut-off cock) are directly concerned with engine operation. The items are as follows: throttle control; h.p. fuel shut-off cock control; main fuel pipe; fuel pressure warning light; r.p.m. generator cables; starter motor cables; igniter plug cables; torch igniter cables; jet pipe temperature transmitter; oil temperature transmitter; oil pressure transmitter; burner pressure transmitter. Overboard drains for the fuel system, combustion chambers, oil, and cooling air must also be provided.

The Nene Lancastrian cockpit is not very much changed from standard, and all main controls, including four throttles, remain in use. Outboard airscrew controls are, of course, unconnected, and the essential Nene instruments have been substituted or added. These are the engine speed indicators (0-20,000 r.p.m.); jet pipe temperature indicator (400-750 deg C); oil pressure gauge (0-80 lb/sq in); burner pressure gauge (0-1,200 lb/sq in).

One of the larger modifications to the Nene Lancastrian, so far overlooked by most people who have examined it, is the provision of a door through the front bulkhead and an escape hatch below the nose similar to that on the Lan-

NENE INSTALLATION

caster. This was considered a desirable addition to an experimental aircraft.

Fortunately, there has been practically no experience of fires in Rolls-Royce jet power units. The advantage in the event of fire of having the unit isolated in a metal-lined compartment such as is provided by the plenum chamber is obvious. However, the enormous quantity of air passing over and through the unit might present difficulties and, as on a piston engine, there would be little purpose in using a fire extinguisher until the unit had stopped. A standard Graviner system comprising bottles, crash and flame switches, is recommended. The engine compartment is supplied through perforated pipes round the front of the power unit, a main ring being located around the base of the inner cone.

A second Nene Lancastrian has now been completed, and although it would not be an economical proposition for the operator, there is no reason (as *Flight* suggested some months ago) why other Lancastrians, of which several must be available, could not be converted and used for a few months on, say, the London to Paris passenger service. It is probable that the operating experience and prestige value would more than offset the small monetary loss to the country.

It is perhaps of interest to note here that where jet refuelling facilities do not exist it is permissible to refuel with ordinary petrol, with the admixture of 3 per cent of lubricating oil. Gas turbines will run on almost any fuel of high calorific value, but if, for example, petrol is used, the range is reduced by about 10 per cent, as compared with the figure for aviation kerosene plus 1 per cent of oil—the normal fuel.

The main dimensions of the Nene Lancastrian nacelles as compared with the power units themselves make an interesting comparison. Figures are as follows:—

	Nene	Installation
Max. diam.	49.5in	55in
Overall length (engine less jet pipe)	96.8in	22ft 7in
Total weight	1,650 lb	2,341 lb

Late this year we may see the first jet-propelled Tudor II in the air. This is a logical next step following the Lancastrian conversions and experimental aircraft are being built, to be powered by Nenes alone. Presumably, like the General Electric turbine jets of the Consolidated Vultee bomber illustrated in our February 6 issue, the Nenes will be installed in pairs. There are several advantages in this arrangement, not the least of which is the ability to fold up the main wheels between the jet pipes and so keep down the depth of the nacelle.

The country is fortunate to have available high-powered gas turbines of unsurpassed quality which have reached as advanced a stage of development as the Rolls-Royce Nene, and although the Nene Lancastrian, first jet-propelled airliner, may be unglamorously described as a flying test bed, it represents a great deal more than this in the form of enterprise and ingenuity.

Beneath the Nene nacelle are (left to right), Mr. Roy Chadwick, Director and Chief Designer of A. V. Roe & Co. Ltd., makers of the Lancastrian, Mr. E. W. Hives, Managing Director, Rolls-Royce Ltd., and Mr. C. E. Fielding, Avro's director in charge of production.

The Nene Lancastrian has a very good performance on the pure jet power of its two Nenes. Mr. R. T. Shepperd, Chief Test Pilot of the Rolls-Royce Flight Development and Testing Establishment at Hucknall, here demonstrates the Lancastrian with inboard Merlins feathered.

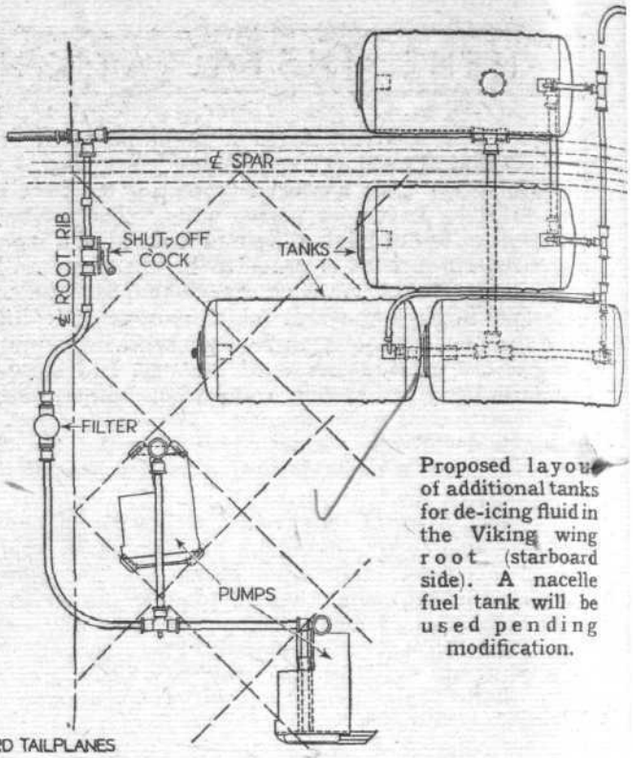
ICE on the VIKING

Important Flying Tests : Results and Remedies : Resumption of Services

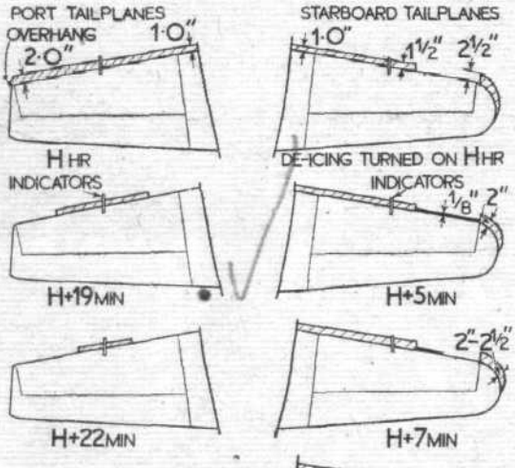
AFTER four months of inactivity Vikings have now, as we briefly recorded last week, regained. A.R.B. approval for operation in icing conditions on all B.E.A.'s routes. Their precautionary withdrawal from service was a severe blow, but it may also well prove indirectly to have been of great advantage to the British aircraft industry. The findings of what must be the most extensive series of flying tests in severe icing conditions, which have been conducted as a result of their withdrawal, are to be made available to all manufacturers by the Vickers-Armstrong company.

Three things are required of a modern aircraft should icing be encountered; the ability to fly and be handled normally—perhaps with some increase of power—with ice on surfaces; the ability, with the aid of its de-icing equipment, to get rid of any ice which has formed and, in anticipation, the power again through the de-icing equipment, to prevent ice from forming at all.

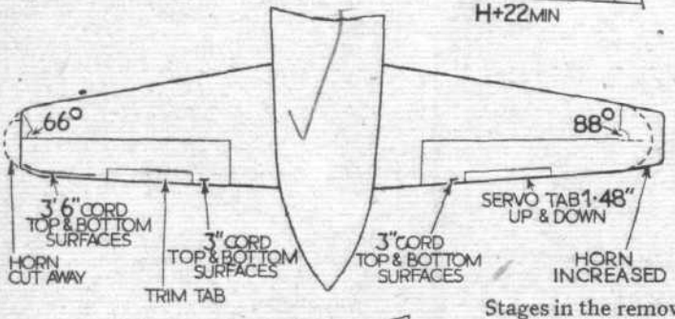
Being the most important problem the aerodynamic one was tackled first. It had been known for some time that the elevators of the Viking, though satisfactory in effect, left something to be desired in their feel. The woolliness had been assumed to be a matter concerning the fore and aft stability of the whole airframe; icing problems have shown that it was caused by too closely balanced elevators. It centres around the B_2 coefficient—the rate of change of hinge moment with elevator angle—and was to a great extent cured as soon as the negative value of B_2 was increased. Should the B_2 coefficient, through icing or other causes, become positive, the elevators would be overbalanced; there must, therefore, be sufficient negative margin to prevent this occurring.



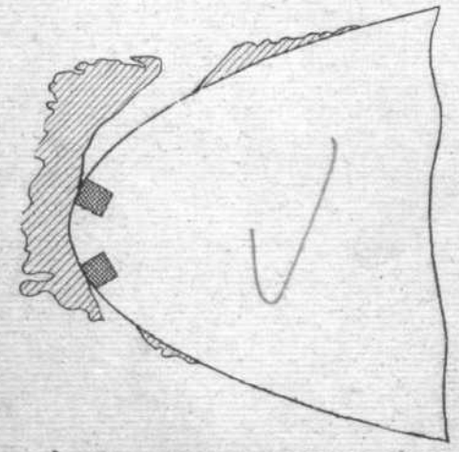
Proposed layout of additional tanks for de-icing fluid in the Viking wing root (starboard side). A nacelle fuel tank will be used pending modification.



Stages in the removal of ice from tailplanes by the T.K.S. system with increased rates of flow.



(Below) Elevator modifications. Quite distinct asymmetry results.



Possible effect of insufficient flow of de-icing fluid. The next stage may be a build-up of upper and lower ice sections to a three-pronged formation.

A second factor which bears on the aerodynamic problem is the asymmetry of slipstream resulting from airscrews rotating in the same direction. Handed airscrews are not a practical proposition, chiefly because of the duplication of spare engines and components which would be entailed. The port horn balance on the Viking has from the start been smaller than the starboard one because the destabilizing effect of the slipstream acts on the port side only. On the modified Vikings, which will go back into service with B.E.A., a quite pronounced asymmetry will exist. This is the first time that the slipstream problem has been countered in this way, but the Vickers-Armstrong Company regard it as a simple and logical step, which may well be adopted by others.

In attacking the Viking elevator overbalance condition several measures were considered:

(1) Spring tab modification.
(2) Cusped trailing edges.
(3) Built-up trailing edges.
(4) Modified horn balances

Longer-term preparation was also made to increase the size of tailplane and to set back the elevator hinges, but other measures have proved successful and this will not now be necessary.

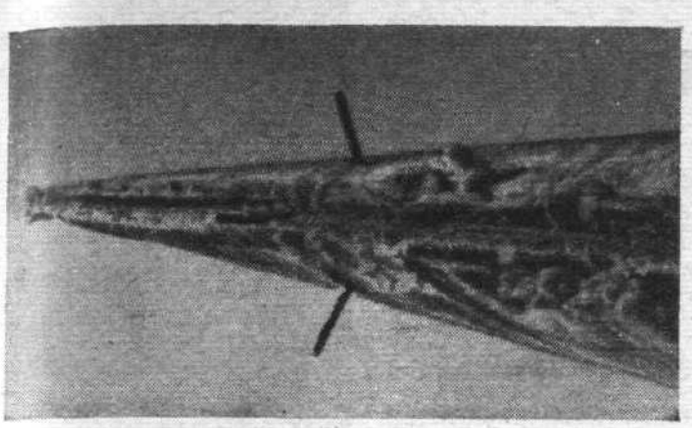
Chief modifications at once adopted for the elevators were:

(1) A reduction in size of port elevator horn to 62 per cent of the original. It is now shielded and is, in effect, only a mass balance.
(2) Addition of 3ft 6in lengths of $\frac{5}{16}$in tube above and below the trailing edges. (See diagram.)
(3) Gearing-up of servo tabs to 1.5in each way instead of 1in.
(4) Addition of a spring compensator (bungee) to give a 25 lb down-load at the controls.

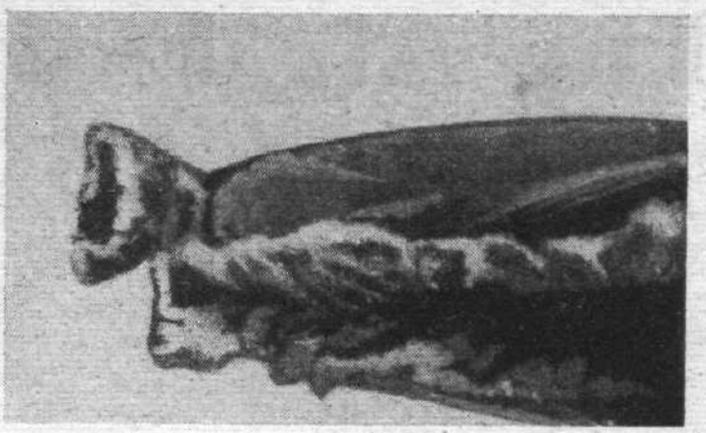
Tests with an increase in size of the starboard horn of 20 per cent were tried and found successful, and a 40 per cent increase is to be adopted. When the large horn is added the interim spring compensator will be discarded.

The effect of the $\frac{5}{16}$in tube on the handling of the elevator controls is to make them heavier, while the increased gearing of the tabs has rather the reverse effect under normal conditions. The aim, successfully achieved, has been to obtain less balance but the same stability under all conditions.

One effect of the modifications to the tail units has been to the stick load in the event of an overshoot. From a powered approach to a balked landing the load is rather less than 30 lb, and from the glide at 90 to 95 kt it may be as high as 60 to 70 lb. This last case would be exceptional, and in that the trimmers are very accessible the



Ice on the leading edge of the starboard tailplane. The upper indicator is free but the horn balance is heavily coated.



A large "cabbage" has formed on the starboard elevator horn.

momentary high load is considered acceptable.

There is no doubt that a thorough practical research into icing should have been carried out some years ago by one of the national establishments. Figures have hitherto been mainly theoretical; A.R.B. estimated flow requirements, now to be modified, are an example which may be compared with T.K.S. recommended fluid flows and the quantities recently found to be necessary for the Viking in practice. Various calculated and tested flow figures are given below. All are expressed in pt/hr/sq ft (or in the case of airscrews pt/hr/ft run), and the two columns, recommended low and high rates of flow.

(1) **Flow estimated by A.R.B.** (to prevent severe icing at −5 deg C and −20 deg C).

Wing and tail	0.18	0.9
Airscrew	0.33	0.83

(2) **Calculated Fluid Required** (R.A.E. Theory).

Wing	1.53	4.00
Tail	1.6	3.0

(3) **Fluid Rates and Duration** (Original System. Normal and Emergency flow).

Wings	0.2	1.0
Tailplane and fin	0.2	1.0
Airscrew	0.33	1.65

Tank capacity 15.4 gal. Duration 2hr 50min or 34min. One pump and T.K.S. Controller giving "normal" or "emergency." (5×normal) flow. One tank (15.4 gal) in starboard inner wing.

(4) **Fluid Rates and Duration** (System as Flight Tested).

Wings	1.0
Tailplane and fin	2.0
Airscrew	0.83

Tank capacity 73.8 gal. Duration 3hr 18min. One pump and T.K.S. Controller. Two tanks, Original (15.4 gal) and nacelle tank (starboard, originally used for fuel) 58 gal=73 gal.

(5) **Fluid Rates and Duration** (Final Scheme, European Aircraft).

Wings	1.0	2.0
Tailplane and fin	2.0	4.0
Horns	8.0	16.0
Airscrew	0.83	1.66

Elements in each horn gap and on leading edge of fin horn and starboard horn. Tank capacity 73.8 gal. Duration 2hr 54min or 1hr 27min. (Duration with 30.8 gal, 1hr 15min or 0hr 37min.) Two pumps and special controller giving full flow from either or both pumps. Not coupled to ice detector. Pump failure warning device.

It must be stressed that in the Viking tests icing conditions were carefully searched out, and the aircraft was then flown around in the area for long periods to collect ice. Only under exceptional circumstances would an aircraft remain in icing conditions for as long as an hour when operating over European routes.

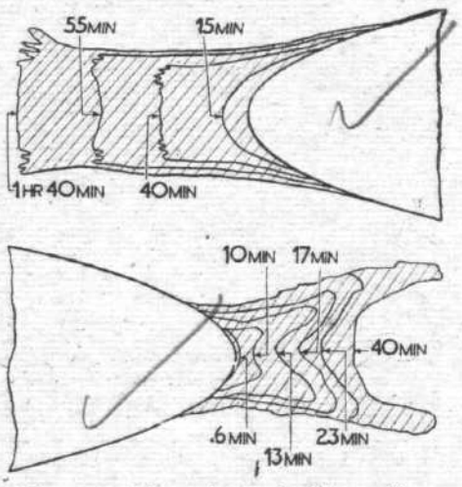
In that the normal flow of de-icing fluid was found to be inadequate, various measures were tried. These were:

(a) An increased average flow over the whole aircraft.

(b) Recalibration of delivery pumps to intensify local flow over tailplanes.

(c) Addition of a second fluid pump as a standby and for emergency delivery increase.

For quick de-icing it was found to be essential to prime the system before the flight, and it then took about 30 seconds for the fluid to begin to appear on clear elements, and about 1 minute from under ice. Within five minutes of the system being started the last nodules were disappearing. Stages are illustrated.



Stages and times for the build-up of ice formations on tailplane leading edges in medium icing conditions.

Most of the tests were conducted in normal icing conditions, and an average rate of build-up was one inch in 20 minutes, although on one occasion of severe icing one inch formed in 3 minutes.

The extraordinary cabbage formation on the elevator horn has been drawn in its various stages of formation. Being entirely stalled, the iced horn had no effect on the elevators except as a mass balance.

Broad conclusions formed from test results were: (1) The Viking as tested was safe even if the de-icing system failed. The increased T.K.S. flow rates are not, therefore, particular to the Viking. (2) The prescribed flow rates were not adequate for European conditions. (3) When modified as indicated, de-icing was satisfactory, and there were no adverse aerodynamic effects.

Additional conclusions were that the original "normal" flow (2×T.K.S. recommended rate) did not remove substantial ice formations, but that it would prevent some icing in mild ice conditions. The aircraft was also found to fly safely on one engine (starboard engine cut) when carrying ice, and on test climbed at 120 ft/min at about 32,000 lb A.U.W.

It should be mentioned that no trouble was at any time experienced with the fin or rudder. However, in keeping with other tail surfaces, their flow will be doubled. For ice prevention the modified T.K.S. system is now satisfactory.

Temporary measures to increase the de-icing fluid capacity on the European Vikings have necessitated the use of one nacelle fuel tank of 58 gallons capacity. As soon as new de-icing fluid tanks can be made and fitted, the nacelle fuel tank will revert to its original purpose. Vikings for non-European services will probably carry 31 gal of fluid.

Airscrew icing gave no trouble at any time, and no ice was seen on newly feathered blades. That ice did form on the blades, however, was proved by dents in the fuselage opposite their tips, and by the considerable hammering noise it made on impact.

Engine icing also gave no trouble, and the internal hot-air intake worked well. Use of hot air for landing has, however, been incorporated in Viking landing drill. This has little effect on power output.

Resumption of Operation

Speaking at a recent conference, Mr. G. d'Erlanger, managing director of B.E.A., said that numbers of Vikings would be back in service by April 20th. The modifications had to be incorporated in all B.E.A.'s Vikings, the production line had to be got going again, B.E.A.'s pilots had to be checked-out again after four months off Vikings, more proving flights would be made as a precaution, and, finally, agents and the public had to be notified of time-table changes.

It is chiefly due to the excellent combined team work on the part of Vickers and B.E.A. that the problems have been satisfactorily solved in a few months. Many pessimists predicted a year's work for solution.

On the first two test flights, made on January 25th and 26th with short-nosed Viking G-AHPG, Capt. James and Capt. Summers, chief pilots of B.E.A. and Vickers respectively, Mr. Edwards, chief designer, Mr. Black of the Air Registration Board, and Radio Officer Cox of B.E.A. flew. Capt. James and his radio officer flew on every subsequent occasion, but were, on occasions, accompanied by W/C. Lowdell, Vickers test pilot, Mr. Richards, also of Vickers, and 1st Officer Crawford of B.E.A.

The Air Estimates

Strength of the R.A.F. Reduced to 370,000 : Aircraft, Engines, Airscrews and Spares to Cost £42,750,000

Mr. Philip Noel-Baker, Secretary of State for Air.

ALTHOUGH the number of Votes in the Air Estimates for 1947-48 remains the same (ten), the form in which the Estimates are presented differs from that of 1946-47 and of pre-war years. To a large extent this is due to the fact that during the war period no financial adjustment was made between the Admiralty, War Office, Air Ministry, Ministry of Supply, and Ministry of Aircraft Production. The pre-war practice of inter-departmental adjustment is being resumed on April 1.

The table on this page gives an abstract of the Air Estimates for 1947-48 and shows the gross and net sums estimated for the ten Votes, the corresponding figures for last year, the decrease or increase under each Vote, and the gross and net totals. The gross figure of £239,186,800 is, of course, the cost to the nation, the net figure being the sum left after deduction of various appropriations in aid.

A total personnel of 370,000 is estimated to be required for the year. This figure includes officers and airmen of the R.A.F., and of Dominion and Colonial forces serving within the U.K. The number of officers is 34,260 and the number of airmen 335,740 In last year's Estimates the corresponding numbers were 79,250 officers and 680,750 airmen, including 2,200 officers and 11,000 airmen of Allied Air Forces.

Reverting to individual Votes in more detail than is given in the table of abstracts of the Air Estimates, it should be explained that the first figure gives this year's gross estimates. Within parentheses will be found, first, the corresponding figure for last year, followed by the increase (+) or decrease (−) which the difference between this year's figure and last year's represents.

Vote 1: Pay, etc., of the Royal Air Force.—Pay, etc., of officers, £17,000,000 (£28,800,000 −£11,800,000); pay, etc., of airmen, £44,000,000 (£86,600,000 −£42,600,000); pay, etc., of the Women's Auxiliary Air Force, £2,368,000 (£4,396,000 −£2,028,000); pay, etc., of the Nursing Service, £205,000 (£224,000 −£19,000); pay, etc., of local forces abroad, £257,000 (£260,000 −£3,000); contributions under National Insurance schemes, £1,650,000 (£1,740,000 −£90,000); war gratuities, £100,000 (£25,500,000 −£25,400,000); post-war credits, £70,000 (£11,500,000 −£11,430,000); extended service bounties to airmen, £450,000 (+£450,000).

It is explained that Air Force personnel who have served in the ranks or as officers, or both, for a period or periods in the aggregate of not fewer than 180 days between September 3, 1939, and August 15, 1946, are eligible for war gratuity for each month of service on full pay, and that the gratuity is assessed on the substantive or war substantive rank held on the last day of full-pay service.

Vote 2: Reserve and Auxiliary Forces.—Pay, etc., of personnel of the Royal Air Force Reserve, £5,000 (£3,000 +£2,000); pay, etc., of personnel of the Royal Air Force Volunteer Reserve, £325,000 (£97,000 −£228,000); pay, etc., of personnel of the Auxiliary Air Force, £130,000 (£45,000 +£85,000); pay, etc., of personnel of the Women's Auxiliary Air Force/R. list, £30,000 (+£30,000); grants to Territorial and Auxiliary Forces, Associations, £50,000 (£15,000 +£35,000); Air Training Corps, £162,000 (£185,000 −£23,000); pay, etc., of members of the Royal Observer Corps, £91,300 (£114,000 −£22,700); miscellaneous services, £7,000 (£5,100 +£1,900).

Until the present emergency is declared ended, officers and airmen on release from service who do not join the reconstituted R.A.F.R., R.A.F.V.R or A.A.F. are generally liable to recall, but are not under any training obligation. Those who join one of the non-regular forces undertake a recall liability for a specified period and also undertake a training liability.

Vote 3: Air Ministry.—Salaries, wages, etc., £3,435,500 (£3,549,000 −£113,500).

The amounts required by the various departments of the Air Ministry are as follows: Air Council, £26,170; Secretary of State's Personal Staff, £7,270; Permanent Under-Secretary, £1,586,000; Chief of the Air Staff, £620,500; Air Member for Personnel, £468,700; Air Member for Supply and Organization, £1,113,700; Air Member for Technical Services, £221,400; Staff of the Meteorological Office Headquarters, £236,700; Staff common to all Departments, £468,260. From the total is deducted pay and allowances provided for under Votes 1 and 6 amounting to £1,318,700.

Vote 4: Civilians at Out-stations.—Salaries, wages, etc., of works staff, £2,000,000 (£2,700,000 −£700,000); salaries, wages, etc., of meteorological staff, £865,000 (£622,000 +£243,000); salaries, wages etc., of aeronautical inspection staff, £285,000 (£13,100 −£271,900); salaries, wages, etc., of other scientific and technical staff, £79,000 (£57,500 +£21,500); salaries, wages, etc., of educational staff, £70,000 (£408,000 −£338,000); salaries, wages, etc., of miscellaneous non-industrial staff, £4,852,000 (£4,514,000 +£338,000); wages, etc., of industrial employees, £9,658,000 (£10,925,000 −£1,267,000).

"Other scientific and technical staff" includes civilian scientific

COMPARATIVE ABSTRACT OF AIR ESTIMATES.

VOTE	1947-48 Gross Estimate	1947-48 Appropriations in Aid	1947-48 Net Estimate	1946-47 Gross Estimate	1946-47 Appropriations in Aid	1946-47 Net Estimate	Net Difference Increase	Net Difference Decrease
(A) Maximum number of Officers and Airmen to be maintained for Air Force Service... ...	—	—	370,000	—	—	760,000	—	390,000
	£	£	£	£	£	£	£	£
(1) Pay, etc., of the Air Force	66,100,000	5,800,000	60,300,000	159,020,000	9,520,000	149,500,000	—	89,200,000
(2) Reserve and Auxiliary Forces	800,300	300	800,000	464,100	100	464,000	336,000	—
(3) Air Ministry	3,435,500	2,500	3,433,000	3,549,000	12,000	3,537,000	—	104,000
(4) Civilians at Outstations	17,809,000	184,000	17,625,000	19,239,600	781,600	18,458,000	—	833,000
(5) Movements	14,283,000	787,000	13,496,000	12,894,000	2,010,000	10,884,000	2,612,000	—
(6) Non-Technical Supplies	23,751,000	1,313,000	22,438,000	22,006,000	1,106,000	20,900,000	1,538,000	—
(7) Technical Supplies and Services	70,928,000	12,970,000	57,958,000	20,983,000	4,109,000	16,874,000	41,084,000	—
(8) Works and Lands ...	31,000,000	3,000,000	28,000,000	28,970,000	1,420,000	27,550,000	450,000	—
(9) Miscellaneous Effective Services	8,542,000	1,110,000	7,432,000	6,572,900	2,359,900	4,213,000	3,219,000	—
(10) Non-Effective Services	2,538,000	20,000	2,518,000	3,128,000	8,000	3,120,000	—	602,000
Total	239,186,800	25,186,800	214,000,000	276,826,600	21,326,600	255,500,000	49,239,000	90,739,000
							Net Decrease ...	£41,500,000

THE AIR ESTIMATES

and technical staff employed on research and other specialist duties, mainly at signals and medical units. Under "Miscellaneous non-industrial staff" is included a sum of £1,320 for the Captain of the King's Flight, who receives in addition a special lodging and subsistence allowance of £150.

Vote 5: Movements.—Conveyance of personnel; travelling allowances and expenses, £8,065,000 (£6,564,000 +£1,501,000); conveyance of stores, £6,218,000 (£6,330,000 −£112,000).

This Vote provides for the cost of movements of personnel of the regular, reserve and auxiliary forces and of civilians employed at the Air Ministry and at out-stations; for the issue of travelling allowances and expenses; and for the cost of movement of stores, etc., arising after initial delivery from contractors.

Vote 6: Non-technical Supplies.—Provisions and ration allowances, £12,350,000 (£14,495,000 −£2,145,000); fuel and light, £3,266,000 (£2,412,000 +£854,000); general stores, £1,595,000 (£1,109,000 +£486,000); clothing and clothing allowances, £5,271,000 (£2,019,000 +£3,252,000); miscellaneous supplies and services, £1,269,000 (£1,971,000 −£702,000).

Covered in this Vote is the supply of provisions, fuel, light, general stores, clothing, water, other accommodation services and animals.

Aircraft and Engines

Vote 7: Technical Supplies and Services.—Aircraft, £42,750,000 (£103,000 +£42,647,000); armament and ammunition, £6,250,000 (£395,000 +£5,855,000); radio, radar and electrical equipment, £4,400,000 (£414,000 +£4,086,000); instruments and photographic equipment, £1,230,000 (£14,000 +£1,216,000); mechanical transport vehicles and marine craft, £3,500,000 (£339,000 +£3,161,000); miscellaneous equipment, materials and technical services, £3,620,000 (£2,335,000 +£1,285,000); petrol, oil and lubricants, £8,600,000 (£17,000,000 −£8,400,000); meteorological equipment, £343,000 (£286,000 +£57,000); educational equipment and materials, £55,000 (£99,000 −£44,000); medical supplies, £180,000 (£98,000 +£82,000).

In the main, the subheads under this Vote are self-explanatory. The first item includes the supply of aircraft; spare aircraft engines; airframe and engine components and accessories; power plants; airscrews; man-carrying parachutes; aircraft dinghies; spare parts for airframes, engines, etc. The subhead also includes provision for modifications, overhauls and repairs by contract.

Vote 8: Works and Lands. Part I: New works, additions and alterations amounting to £10,000 each and upwards, £10,500,000 (£7,900,000 +£2,600,000); Part II: New works, additions and alterations under £10,000 each, £600,000 (£600,000); Part III: Ordinary repairs, renewals and maintenance, £12,000,000 (£14,075,000 −£2,075,000); plant for use on works services, £200,000 (£275,000 −£75,000); grants towards the cost of works, £100,000 (£20,000 +£80,000); purchases of lands and buildings, £3,500,000 (£1,500,000 +£2,000,000); rents and reinstatements, £4,000,000 (£4,500,000 −£500,000); surveys and miscellaneous services, £100,000 (£100,000).

This Vote provides for the construction and upkeep of R.A.F. buildings and airfields, supply of fixed machinery and plant, purchases and rents of lands and buildings, and the operation of electrical, heating, water and drainage plants. Wherever practical, works services are carried out by contract. The increase is due to increased provision for construction of married quarters, of new barracks and messes, for reconstruction of airfields abroad, and for the acquisitio of sites occupied by requisition during the war and required for future use.

Vote 9: Miscellaneous Effective Services. Fees and other payments for personal services, £123,000 (£123,000); charges for training personnel at courses outside the Royal Air Force, £1,070,000 (£1,510,000 −£440,000); miscellaneous educational services, £158,000 (£150,000 +£8,000); grants in aid of institutions and associations, £19,000 (£1,000 +£18,000); welfare expenses, £148,000 (£85,000 +£63,000); publicity expenses, £50,000 (£150,000 −£100,000); compensation for losses, damage, etc., £302,000 (£455,000 −£153,000); charges for hospital services, £81,000 (£35,000 +£46,000); loss by exchange, banker's commission, etc., £7,000 (£20,000 −£13,000); telecommunication services, £750,000 (£757,000 −£7,000); miscellaneous expenses, £204,000 (£226,900 −£22,900); rebate in respect of military stores of lend-lease origin issued to certain governments, £2,800,000 (£50,000 +£2,750,000); pay, etc., of Polish personnel, £2,800,000 (£3,000,000 −£200,000); payments to enemy prisoners of war, £30,000 (£10,000 +£20,000).

The term "Miscellaneous Effective Services" covers payments and receipts which do not come within the scope of any of the other Votes The principal items of expenditure are the charges for training R.A.F. personnel at courses outside the R.A.F., pay of Polish personnel, and rebate in respect of lend-lease stores issued to certain governments.

Pensions and Gratuities

Vote 10: Non-effective Services. Retired pay, half-pay and wounds pensions of officers, £950,000 (£911,000 +£39,000); gratuities to officers, £600,000 (£1,341,000 −£741,000); commutation of retired pay and wounds pensions, £34,300 (£30,000 +£4,300); pensions, gratuities and allowances to widows, etc., of officers: relief fund, £35,000 (£34,000 +£1,000); Other ranks; pensions to other ranks, £470,000 (£321,000 +£149,000); gratuities to other ranks, £63,000 (£121,000 −£58,000); commutation of pensions, £20,000 (£14,000 +£6,000); rewards to other ranks for gallantry decorations and the long service and good conduct medal, £3,000 (£73,000 −£70,000); pensions, gratuities and allowances to widows, etc., of other ranks, £23,500 (£22,500 +£1,000); Civilians: civil superannuation allowances, £101,000 (£86,500 +£14,500); compensation allowances (loss of office), £1,500 (£500 +£1,000); non-recurrent allowances (additional allowances and gratuities)—established civil officers, £87,500 (£67,000 +£20,500); compassionate gratuities—unestablished civilians, £78,500 (£31,000 +£47,500); injury grants under the Workmen's Compensation Acts, etc., £65,000 (£72,000 −£7,000); miscellaneous civil non-effective payments, £2,700 (£1,500 +£1,200); compensation to members of the Air Training Corps and to their dependants, £3,000 (£2,000 +£1,000).

It is explained that disability awards to officers, airmen and airwomen, and pensions to their dependants in cases where disability or death is attributable to, or aggravated by, service during the wars of 1914-18 and 1939-45 are awarded by the Ministry of Pensions, and such awards are chargeable to the Vote for that department.

THE MEMORANDUM

AS is customary, the Air Estimates are accompanied by a Memorandum by the Secretary of State for Air. Mr. Noel-Baker points out that in ordinary times the flow of officers and airmen into and out of the force is small compared with its total size. The training establishments and squadrons into which the new intake passes are manned by the seasoned product of previous years. The trained element of the force not only provides instructors but maintains the aircraft, organizes supplies and administers the men. Since the war the R.A.F. has been releasing a large proportion of the intakes of the war years. These losses must be made good by the training establishments, but the process is a race against time since, if the output is too small, the training establishments themselves cannot be manned, and a vicious circle is created, diminishing training output producing a diminishing training potential.

The front line of the R.A.F. is, in effect, part of the training organization and must include a minimum nucleus containing the vital elements—fighter, bomber, maritime, transport, tactical, etc.—without which the operational technique cannot be maintained and developed.

Apart from the problem of training, demobilization has set a heavy administrative task, particularly in the matter of movement, since the release of each man may involve several consequential postings. Main consequences of the foregoing conditions are that an abnormally high proportion of the force is contained in training establishments, and the standards of output per man-hour are lower than they should be. The Air Council, Mr. Noel-Baker states, are taking all steps to obtain maximum output from a given manpower in the force, but improvement of efficiency must depend on regaining greater stability and a high average of skill and experience. The force needs to re-engage the greatest possible number of wartime entrants who have learned their trades and can add to the efficiency of the force immediately they rejoin.

Of personnel the Memorandum states that only 2,250 officers who held permanent commissions before the war remain in the R.A.F. and in consequence the quality of the large number of officers who have been or are being appointed to permanent commissions will set the standard of efficiency in, and determine the character of, the R.A.F. for many years to come. Recruiting for regular engagements of young men direct from civil life has been good, but the most urgent need is for more trained and experienced men to re-engage for regular service, both as aircrew and in the ground trades. So far the numbers have not come up to expectations.

Mr. Noel-Baker recalls that the 20 flying squadrons of the A.A.F. have already been formed, and have started recruiting. Within the A.A.F. new Air Defence Units have been introduced, to man operations rooms and reporting stations which control the fighter and anti-aircraft operations in war. The first of these units was formed and started recruiting last month. The Estimates also provide for the formation of units of the Auxiliary Air Force Regiment, for the close defence of airfields.

It is proposed in the coming year to re-open recruiting for the general reserve of the R.A.F.V.R., with the aim of providing flying training for pilots and navigators released since the war. Training will be generally similar to that of pre-war days. Certain new types of ancillary units of the R.A.F.V.R. will be formed later. University Air Squadrons have been formed as units of the R.A.F.V.R. at 11 universities in the U.K.

Vote 2 also provides for grants to units of the A.T.C. The ceiling of the Corps has been set at 75,000 cadets, and the Secretary of State comments that this "should make it reasonably certain that any cadet who wishes to render his national service with the R.A.F. should be able to do so." It has already been announced that any A.T.C. cadet with a proficiency certificate who is medically fit and who desires to enter the R.A.F. will be guaranteed a place as long as any vacancy exists. The Secretary of State for Air adds that in addition it has been decided that these proficient cadets will be afforded priority in selecting the trade of their choice from the list of trades open to recruitment.

The policy on which the supply programme is based was described in the White Paper on Defence (Cmd. 7042), to which reference is made on p. 227 of this issue.

Personnel Licensing Recommendations: Salary Demands in Australia : New Decca Chain

"IN THE SAND": Passengers leaving a B.O.A.C. Lodestar at Almaza Airport, Cairo. The Dakota in the foreground belongs to Ethiopian Airlines.

CIVIL AVIATION NEWS

AIR NAVIGATION BILL

EXISTING international obligations with regard to air navigation are governed by the Paris Convention of 1919, to which statutory effect in the United Kingdom was given by the Air Navigation Act of 1920. The Chicago Convention will replace the Paris Convention and the Air Navigation Bill has been designed to replace the corresponding provisions of existing legislation.

Lord Nathan guided the Bill through the Committee stage of the House of Lords, and many amendments were made before it was read for the second time in the House of Commons on February 21st.

States which were not parties to the Paris Convention entered into the Havana (Pan American) Convention, 1928, which applied only to the American Continent. Parties to the Paris and Havana Conventions are now under an obligation to denounce those Conventions on ratification of the Chicago Convention. This was done by the United Kingdom in May, 1946.

The Chicago Civil Aviation Conference of 1944 was convened by the United States and the main objects were to establish a new multilateral convention to lay down uniform technical codes and practices to supersede existing conventions on international air navigation law.

In relation to technical matters the Chicago Convention is broadly of the same scope as the Paris Convention and the powers sought in the Bill are directly related to the subject matter of the technical annexes of the Chicago Convention, and are necessary to enable the United Kingdom to fulfil its international obligations. They also include supplementary powers necessary for the regulation and development of air navigation to United Kingdom standards. The powers, however, are substantially the same as the existing powers conferred by the previous acts.

The Opposition regarded the Bill as uncontroversial and had little criticism to make. Several technical points were raised, however, and information was requested in connection with the operation of aircraft in this country and the regulations as they are to be applied to individuals. Owing to the discussions which took place in the House of Lords and the resultant clarification, the Opposition were satisfied and took no exception to the powers which were sought by the Bill. Mr. Lennox-Boyd welcomed the fact that the Parliamentary Secretary had not repeated the Minister's doctrine that powers should be drawn as widely as possible but their exercise should be narrow. An assurance was asked for that nothing would be done under that power to alter the accepted view that if a captain of an aircraft was unwilling to fly he should not be obliged to, and if he was stopped from flying on orders from an airfield official it should be for reasons that did not come within his accepted responsibility as a captain.

Mr. Lindgren, in replying to the many questions, assured the House that the powers of the Minister given by the Bill would not enable anyone at any time to instruct a pilot or captain of an aircraft to take off. It gave power to the controller of the airport to say that it was unsafe for an aircraft to fly and that therefore it should not take off. The Ministry, as the managing authority, must have, he said, some responsibility for the lives of persons in the aircraft. He also gave an assurance that there was no discrimination between the charter companies and the Corporations. He did say, however, that where large Corporations were operating from airports there must be a relationship between the amount of usage and the facilities provided.

Mr. Lindgren gave an undertaking that he would look into the question of the suitability of Croydon as an airport after complaints from A. Cdre. Harvey that it was dangerous, and further discussions, he said, were to be held with European countries on the advantages of Gee. Pilots who break the rules of the air were somewhat of a problem, for if it was a matter of deliberate disobedience, all that could be done at present was to report the matter to the appropriate authority in the country to which the pilot belonged. He did not know whether we should ever be able to ground pilots because of errors or indiscipline in the air. Discussions were taking place with a view to establishing more satisfactory Met. services.

The Parliamentary Secretary was unable to say what principle determined the charges made for the use of landing facilities at airfields. They were, he said, influenced by the density of traffic at the airport, the number of aircraft landing, and the costs of maintenance. He thought it would never be possible to arrive at an economic landing charge which would cover running costs and capital developments. He also assured the House that the attention of the Minister would be drawn to the difficulties which might arise if too rigid an application of Customs regulations was made, which would increase the difficulties of foreign airlines of keeping spare parts in this country.

STAFF AT THE MINISTRY

DURING Mr. Lindgren's recent speech to the House asking for a token vote of £10, he revealed the anticipated staffing position of the Ministry of Civil Aviation as it is expected to be on April 1st this year. The secretariat and common services staff will number 620, the department running airfields, 330, and the technical services department, 500, making a total headquarters staff of 1,450. At outstations, in charge of traffic control, telecommunications, and technical services, the staff now amounted to 1,932, for airport management, 1,118, and these, with an industrial staff of 1,400, made a total of 4,450. During the debate Mr. Butcher drew attention to the fact that in 1946 there were 485 at headquarters, and in 1945 only 292 on the staff. The number, including the signals branch, had therefore more than doubled during the past two years. The expense of this had shown a corresponding increase. The figure for 1945 was £549,000, and the revised estimate presented was now for £1,356,000.

CONSTELLATION INCIDENT

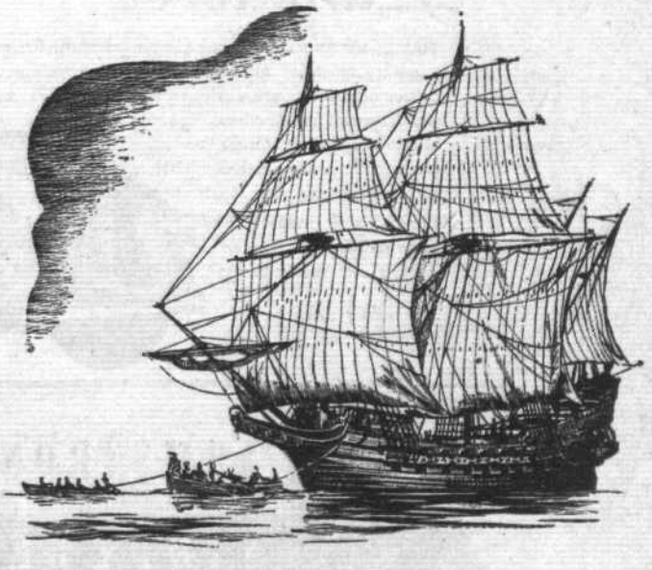
A REPORT issued by General Ziegler, technical director of Air France, on the recent trans-Atlantic flight of a Constellation which finished on two engines, states that the initial cause of the trouble was faulty operation of the unit linking

AVRO TUDOR II

AVRO

Since Tudor times, Britain has led the world in transportation

In world transportation Britain has long been the acknowledged leader—little ships that in Tudor times circumnavigated the globe—steamships that carried the world's trade—railways, too, almost exclusively British in their development. Air transport follows naturally. Themselves pioneers in aviation, Avro well maintain Britain's lead. The Avro Tudor II, in which performance is soundly balanced with reliability, carries 40-60 passengers in luxury comfort over ranges up to 3,000 miles. Fully pressurised and air-conditioned, it has an economical cruising speed of 235 miles an hour and a top speed of well over 300.



A. V. ROE & CO. LTD., MANCHESTER, ENGLAND (Branch of Hawker Siddeley Aircraft Co. Ltd.)

CIVIL AVIATION NEWS

No. 4 engine to its airscrew. This, presumably, means that there was a failure in the reduction gear assembly. The report then goes on to explain that an oil leak developed in the unit, which rapidly drained the front section of the engine. The engine was stopped but the airscrew continued to windmill, causing overheating and seizure of the bearings. Particles of molten metal were ejected which, with the burning of the remaining oil, gave the impression of fire. Investigation has established without doubt that there was no petrol fire. The airscrew of No. 4 engine was eventually shed and, as it broke away, came into contact with the airscrew of No. 3 engine, breaking off portions of the blades and causing damage to several cylinder heads. This caused vibrations and No. 3 airscrew had to be feathered. Flight on the two remaining engines continued satisfactorily at 1,250 h.p., and the aircraft landed safely at Casablanca, having averaged 150 m.p.h.

Examination has shown that no damage was caused to the airframe, and the aircraft will resume normal operations as soon as the two damaged engines are replaced. Contrary to earlier reports, none of the cargo was jettisoned at any time.

AIRCREW LICENSING

THE Personnel Licensing Division of P.I.C.A.O. met during January and made recommendations for the licensing of those specialists responsible for the operation of civilian aircraft. The broad outline of the recommendations for the licensing of pilots, navigators, radio operators and flight engineers will probably be accepted in the United Kingdom, but there are details in connection with the ratings for instrument flying and flight instructors which have yet to be determined and which will inevitably postpone ratification of the new scheme. It seems probable, however, that new regulations will be instituted within about twelve months. Some hint of these regulations was given in *Flight* just over a year ago.

Details of the qualifications and experience required for each licence are too extensive to be recorded fully at present, but it will be helpful to pilots to know the recommended new categories of licences, for it is in this class that the most important changes have been made.

There are five types of licences, starting with the Student Pilot Permit. This allows the holder to fly solo under supervision of, or with authority of, a rated flight instructor, within the State granting the permit.

Having completed forty hours dual and solo, including a solo cross-country, a Private Pilot Licence may be obtained. Candidates must be more than 17 years old and must fulfil the medical requirements. In addition, a competent authority has to be satisfied that the applicant's knowledge of flying regulations and air traffic rules in visual flight is adequate. An elementary knowledge of charts and the use of the compass is also necessary. This licence permits the pilot to fly, without remuneration, any aircraft without passengers, or with passengers in a class for which he is rated. Flights may also be made as co-pilot in any aircraft not flying for remuneration or in an aircraft carrying fare-paying passengers, if a co-pilot is not obligatory.

At 18 years of age a pilot fulfilling all the medical requirements and with experience of not less than 200 hours' flying, of which 100 has been as captain of an aircraft, qualifies for a Commercial Pilot's Licence. The applicant must satisfy the authorities on a number of subjects, including, in addition to those for the private pilot, the theory of flight, aircraft equipment, airframe and power plant maintenance. This licence carries all the privileges of the Private Pilot Licence, and also permits the holder to fly as captain for remuneration in non-scheduled transportation in aircraft weighing not more than 12,500 lb, in the class of aircraft in which a rating is held. This applies to visual flying conditions. In instrument flying conditions an instrument rating must be held, but passengers may not be carried for remuneration.

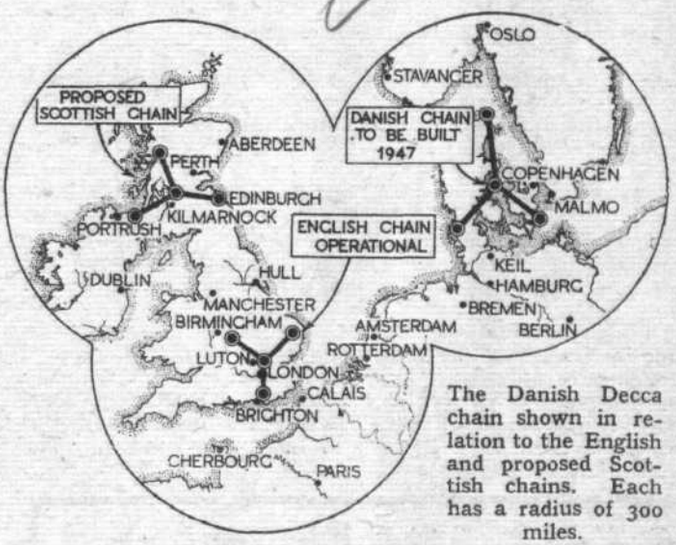
A new category has been inserted one class higher than the Commercial Pilot's Licence, which is available for applicants over 21 years of age who fulfil the same medical requirements and who have a greater knowledge on the subjects previously mentioned. Applicants must have flown 700 hours, including 200 as captain, of which 25 hours were by night. This licence permits the holder to captain any aircraft not on scheduled air transport weighing up to 12,500 lb, and an aircraft weighing up to 30,000 lb of the type for which a rating is held. The holder may also fly as co-pilot in any scheduled air transport. This category bridges the gap between the Commercial Pilot Licence and the higher grade of Airline Transport Pilot Licence, and allows pilots to gain experience on non-scheduled and scheduled operations to bring them up to the higher qualifications.

The Airline Transport Pilot's Licence is the highest category and may be held when 1,200 hours have been flown, of which 100 are at night and 250 are as captain. Seventy-five hours' instrument flying must be included, but 25 hours may be acquired on mechanical devices. As in the other categories, flying skill has to be demonstrated in all manœuvres, but the tests for this licence are naturally more exacting than for the lower grades. Also, a far greater theoretical knowledge must be proved The Airline Transport Pilot's Licence allows the holder all the privileges of the lower categories, and to fly as captain on scheduled air transportation in aircraft for which the holder is rated.

DANISH DECCA CHAIN

THE Danish Ministry of Marine, acting on behalf of the Danish Government, recently signed an agreement with the Decca Navigator Company for the construction and operation of a chain of stations for the Decca Navigator System to be sited in Denmark. Fixes are expected to be accurate to within 20 meters in such places as the Kattegat and to within 100 meters over the North Sea, in the Skaggerrak and the Southern Baltic. Plans for the Danish system have been co-ordinated with the layout of the existing English chain and the proposed Scottish chain.

The Danish Government are anxious that the service shall be provided as soon as possible, and it is hoped to have the system in satisfactory operation by the end of this year. The area to be covered by the three chains will be in the region of 727,000 square miles, and this service will naturally be available to aircraft as well as shipping fitted with Decca receivers.



The Danish Decca chain shown in relation to the English and proposed Scottish chains. Each has a radius of 300 miles.

AUSTRALIAN PILOTS' SALARIES

THE Australian Airline Pilots' Association has made a claim to the three major airlines in Australia—Qantas, A.N.A. and T.A.A.—for a revised scale of salaries. The scale varies according to the weight of the aircraft flown and the rank of the pilot, and is as follows:—

Grade	Aircraft Wt.	Pay
Second officer ...	Under 100,000 lb.	£450—£500
First officer	Under 50,000 lb.	£600—£750
First officer	50,000 lb. and under 100,000 lb....	£700—£850
Captain	Under 10,000 lb.	£750—£1,050
Captain	10,000 lb. to 50,000 lb.	£1,000—£1,300
Captain	50,000 lb. to 100,000 lb.	£1,250—£1,550

For night flying an additional 2s 6d per hour for first and second officers, and 5s per hour for captains, and for overseas flying additional pay on a yearly basis, has been requested. Captains flying on the Far East and India route would receive an extra £300-£400, and on routes to North and South America and the British Isles £400-£500. On these scales a first-class captain flying aircraft in the heaviest category on the route from Australia to the United Kingdom or America would receive a total of just over two thousand Australian pounds. Captains on the Pacific route, with long periods of night flying, would receive an additional £300 approximately.

Annual leave in Australia of twenty-eight days, plus fourteen days' local leave for a pilot based overseas, and two

CIVIL AVIATION NEWS

full days clear of duties at his base for every three days spent by the overseas service pilot away from his base, is also one of the requirements. It is hoped to increase the insurance for death and accidents to sums ranging from £3,000 for a second officer, and £5,000 for a captain. Some of the members of the Association are opposed to the claim on the basis that by acting as a union they will lower the prestige of their profession. There is no indication that if agreement is made with the major companies there will be a similar application to the smaller airlines and charter companies.

DECCAN AIRWAYS

DECCAN AIRWAYS, which started operations in February last year, is now nearly in full operation. Five Dakotas are in service and two more have recently been purchased, one of which will be used solely for the carriage of cargo. The service between Delhi and Madras, which stops at Gwalior, Bhopal, Nagpur and Hyderabad, is run daily and is carrying a large volume of traffic, stimulated by the recent number of conferences and meetings which have been taking place in Delhi. The Dakotas are also operating twice a week between Hyderabad and Bangalore, and a new service has just started daily between Bombay and Hyderabad. The only operation outside India so far has been a charter to Baghdad, Damascus, Cairo and Rome. Three Doves have been ordered which will be placed on the Bangalore-Hyderabad route and other additional services.

CARGO DIVISION ABANDONED

FORMATION of the special Cargo Division in British European Airways has been postponed owing to the refusal of the Treasury to sanction purchase of the eight Dakota freight aircraft from Service sources, and which were intended as the nucleus of the Division. The Corporation now propose to set up a special cargo section within the Continental Division as soon as three Vikings can be converted into freight-carrying aircraft. It is intended that the long-nose 24-seater Vikings will replace, as they become available, the short-nose aircraft on the passenger routes, and it is the first three to be replaced which will be converted for the special section.

BREVITIES

The de Havilland Doves recently delivered to Sabena have started operations between Brussels and Luxembourg, the flight being made in forty-five minutes.

* * *

The International Civil Aviation Organization ceased to be provisional on March 1st, when members signed the official documents creating the permanent organization.

* * *

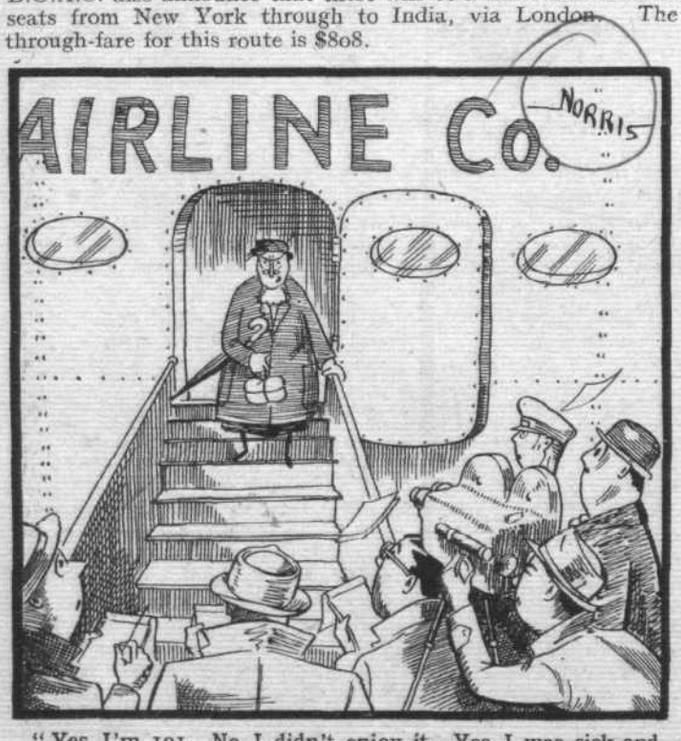
B.O.A.C. completed a million miles' flying with Constellation aircraft on February 26th. The Corporation operates five Constellations, and opened the transatlantic service with these aircraft on July 1st, 1946.

* * *

From August to December last year Airwork ran a leave service between Cairo and London for the Sudan Government. The contract has been renewed for the present year, and the first flight started on March 2nd with a Bristol Wayfarer. The remaining flights, it is understood, will be made with Vikings.

* * *

Through bookings via B.O.A.C. and B.E.A.C. can now be made in New York for destinations served by B.E.A. Special through-rates have been fixed, and passengers will normally stay one night in London at the expense of the Corporations. B.O.A.C. also announce that there will be a limited number of seats from New York through to India, via London. The through-fare for this route is $808.



"Yes, I'm 101. No, I didn't enjoy it. Yes, I was sick and terrified and I'll never travel in one of these awful things again."

Permission has been granted by P.I.C.A.O. for B.O.A.C. to adopt the code word *Speedbird* as the R/T call sign for their aircraft. This will replace the present call sign *Britair* on all their routes.

* * *

Jersey States have decided to send a delegation of five, headed by Sir Alexander Coutanche, to London in order to interview representatives of the Government on the subject of civil aviation in the Islands, and the possibility of an agreement concerning air operation by private companies.

* * *

Under an agreement between the United States and Siam, Pan American Airways are to operate through Bangkok in both directions on routes from the United States and India. A Siamese airline is authorized to serve a route from Siam to Honolulu and Los Angeles.

* * *

A commission consisting of representatives of the Norwegian Ministry of Civil Aviation, D.N.L. and Bergen City Council, is to decide the location of a flying-boat base for the city. Hitherto the harbour has been used, and passengers have been taken by launch to and from the aircraft. Modern facilities are now to be provided for operating the Sandringhams.

* * *

It is understood that 200 Piper Cub L.4s have been purchased from American Army surplus stores in Europe by the Polish Ministry of Transport. It is assumed that they will be used for Army training and club flying.

* * *

The Pan American Airways' twice-weekly service from New York to Leopoldville has been extended to Johannesburg. Connecting services are available from the United Kingdom and Europe. The fare from Lisbon to Johannesburg is £142.

* * *

The Swedish Government has renewed the contract with A.B.A. for operating regular air transport services in Sweden. The company's report for 1946 indicates that it was their best year since operations commenced. There is no intention to extend routes in 1947, but the present services will be improved and intensified where possible.

* * *

The Australian Federal Cabinet have appointed Mr. W. C. Taylor, deputy chairman of the Air Lines Commission, Mr. G. P. N. Watt, treasury representative of the Commission, and Sir Keith Smith as directors on the board of Qantas Empire Airways. The appointments have been made to fill vacancies caused by the acquisition of the B.O.A.C. shares by the Australian Government.

* * *

Canadair, who will be remembered for development work on the DC-4 with Merlin engines, has become a subsidiary of the Electric Boat Company, of New York. The American firm is believed to have contributed at least £250,000 to Canadair, and in addition has loaned the company a considerably larger sum. The Canadian Government's rights in the DC-4M, or North Star, has also been transferred. Production of the DC-4M will continue as originally planned, and the company will proceed with its normal activities of converting and overhauling transport aircraft.

The Percival

PRINCE

Designed for Feeder Lines and Charter work, the Prince, a new medium Transport Aircraft, is an all-metal, high wing Monoplane with nose wheel undercarriage, seating 8-10 passengers .... Powered by two 505 h.p. Alvis Leonides Engines driving constant speed, feathering and braking propellers .....Cruising at 170 miles per hour at 6,000 feet using only 50% power, with a top speed of well over 200 miles per hour ..... Carrying 8 passengers, 2 crew and 400 lbs. of luggage over a range of 800 miles ..... Designed for use with wheels, floats or skis ..... All P.I.C.A.O., and A.R.B. requirements are fully met in the specification of the Prince.

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A few months ago the overhaul period of the Gipsy Major I engine was officially extended from 1,000 hours (already a world record) to 1,260 hours. An engine from a Tiger Moth was the first to run the longer time and has recently been sent in for routine strip and overhaul. All main and big-end bearings (all of which had been supplied by Hoyt) went back into the engine untouched, with the exception of one connecting-rod bearing which showed slight dryness, easily cleaned out.

Main and big-ends on crankshaft were well within drawing tolerances for a new engine.

Similar bearings have now completed **four** periods of 1,260 hours between complete overhaul making a total of 5,040 flying-hours.

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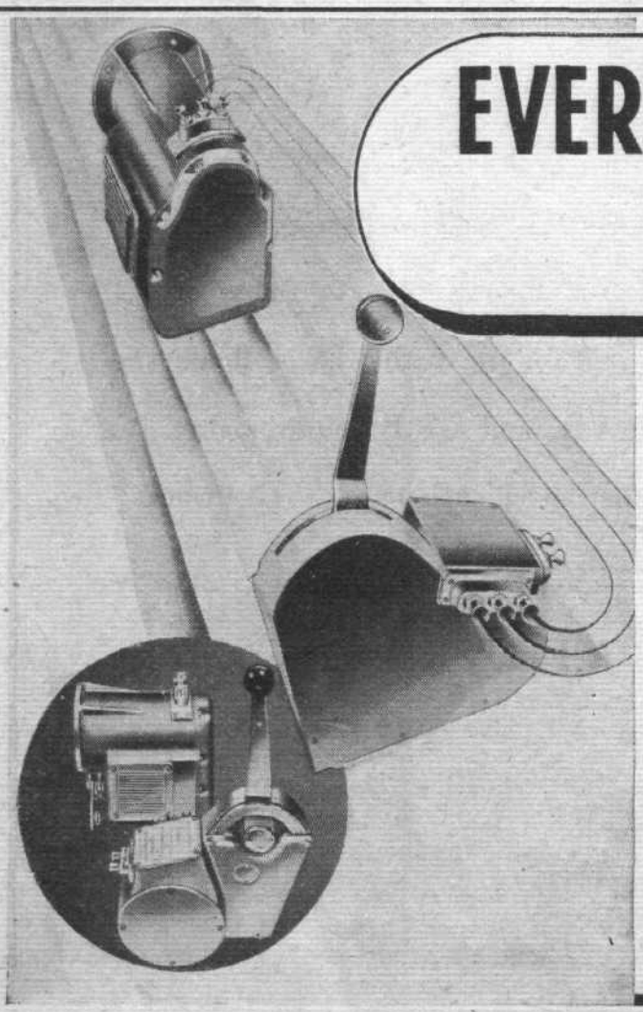

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The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

P.R.U. BADGE?
The Penalty of Self-Effacement

I WOULD be very grateful if you could find room in some corner of your very excellent magazine for the following query, which, though not up to the high standard set by the learned X-chasers who weekly do battle at a "high level" in the correspondence columns of *Flight*, is nevertheless at a sufficiently "high level" in a different sense to be of possible interest to other P.R.U. types!

Do any of your readers happen to know if there is in existence an official or semi-official P.R.U. Squadron badge in any shape or form?

Though I was aware of, and appreciated, the need for P.R.U. self-effacement during the war, I feel that it would be a poor show indeed if it was not now allotted its own badge as official recognition of its good work during the war—even if it were only a couple of empty camera spools crossed on a sea of contrails!

"BENSON 1942."

A.M. versus A.T.C.
Official Statement Challenged

THE statement made by Mr. Thomas Cochrane (*Flight*, February 6th), to the effect that the promise of reduced periods of recruit training for ex-A.T.C. Cadets in the R.A.F., has been implemented since January 1st, 1947, is quite incorrect. Allow me to quote a case in point affecting the ex-N.C.O. of the squadron with which I am connected.

This Cadet was called-up to the R.A.F. on January 6th, 1947, and in a letter written on January 18th to one of his friends, who is also an N.C.O. in the same squadron, he stated that—"it does not make the slightest difference in the duration of recruit training whether one has been in the A.T.C. or not"—and quotes as his authority the parade sergeant.

The matter was taken up officially with Group, who in turn contacted Reserve Command, and in an acknowledgment received from Group, dated February 3rd, 1947, it is stated that the particular case referred to is not an isolated one, and that the matter would be rectified with "as little delay as possible."

In view of the serious breach of faith involved, I feel that the responsibility should be accepted by the Air Ministry, and the assurance given that the matter is being rectified, rather than that the Senior Press Officer, Air Ministry, should rush into print without first ascertaining the true circumstances.

"ADJUTANT."

POWER UNITS
Some Early Examples Recalled

I WAS surprised to read in your issue of February 13th that "power units" (in the sense of an engine with mounting and cowlings assembled as a unit from bulkhead forward, ready for installation on settled pick-up points) were only "proposed and the first examples produced" in the late 1930s.

Many of your readers will remember the Bristol Brandon ten-seater of about 1924, which was operated on the London-Paris route for some years. It had a Jupiter engine installed with its cowling, exhaust system and accessories in a four-point mounting structure built separately from the airframe and so attached to the latter that the whole power unit could be hinged sideways on two of the pick-up points, to facilitate inspection and maintenance, or rapidly removed and interchanged. A similar unit with a Lucifer engine was fitted to the Bristol Taxiplane of the same era.

No doubt Bristols were "before their time" with these particular power plant designs, but they surely deserve credit for turning to account twenty-three years ago the considerable advantages offered by the radial engine for installation as a compact, interchangeable power unit.

Later on in your article it is implied that the first power plant with standardized bulkhead diameter and pick-up points, and separate gear box for aircraft accessories, was that of the Merlin-Lincoln. Here again readers with better memories than your contributor's will recall that a Hercules power plant with all these features was shown several years earlier, namely, at the Paris Salon of 1938. It was the prototype of many thousands of Hercules standardized power plants that were made for R.A.F. heavy bombers and transports from 1940 onwards. Its direct but much refined descendants of to-day are the Hercules power plants of the Hastings and the Hermes, and the Centaurus power plant of the Ambassador.

R. N. K. AVELINE.

GAS TURBINE SILENCING
Idea of 20 Years Ago

ON looking back through the April 25th, 1946, issue of *Flight* on the Metrovick gas turbine and the paragraph on page 420, viz., "This has an effect on noise suppression which is most marked," I am reminded that I used this same method in an old Patent, No. 19372, dated 5/8/26, which has taken 20 years to give proof of the theory on which my turbine condenser silencer operated.

I was never able to get the device made or any firm interested, except Mr. R. Bickerton, of National Gas Engines, who said it was the nearest thing he had seen to an internal combustion turbine engine.

The specification and purpose of the device was the contraction of hot gases, instead of in the present turbine of expanding the atmosphere brought through the turbine.

The Air Ministry was approached by me on several occasions, but no results obtained. However, the effect of the ducted fan on present-day turbines and the claim for extra efficiency is the same as I put forward in my specification. This may speed up further design in turbines.

I have only one copy of the specification now left, which may be of historical interest.

W. KNIGHT.

ACCIDENT PREVENTION
Rocket Assistance Suggested

AT the present time we are experiencing an alarming number of air accidents, and much criticism has been levelled at airline operators, manufacturers and personnel connected with civil aviation, but this does not in any way solve the problem I feel that some constructive suggestions are needed to eliminate these disasters, which are not only causing loss of life, but also doing harm to the whole aircraft industry. Something is wanted now to increase the safety of aircraft, something that can be put into operation very quickly

Although due to variety of causes, which I will not mention here, nearly all accidents occur when the aircraft is either taking-off or landing. In other words when the airspeed is just above stalling speed. My suggestion is that a means be devised whereby in cases of emergency the speed of the aircraft can be increased by 20 to 40 miles per hour to bring it reasonably above stalling speed, so that the pilot will have effective evasive action.

As an interim measure I would suggest the use of JATO or RATOG units to be used as follows:—

When the aircraft is coming in to land and there is an obstruction, such that the pilot has to climb rapidly, at the same time perhaps making a turn, the rocket units should be put into operation. At present the result of such a predicament is a crash, but the extra thrust provided by these units should give enough airspeed for the necessary manœuvres to be carried out. The pilot would then have avoided an accident, at the same time gaining enough speed and altitude to attempt a fairly easy landing.

The same course of action would apply to take-off and although more difficult, due to heavier wing loading, should still bring the aircraft out of danger. In the case of engine failure the extra thrust should help to compensate for the loss of engine power and should enable a fair altitude to be gained, giving the pilot a fighting chance to bring his machine to safety.

It is those few seconds when an accident seems imminent that count so much, and this advice would not only provide a means of escaping the accident, but would assist the pilot to make a good landing afterwards.

An installation as above would have several advantages:—
(1) The modifications needed should not be very extensive;
(2) the cost would be low;
(3) surplus stores of these units could be utilized.

I have given details of my suggestion to the Air Registration Board and trust they will give it a good trial.

H. J. MANNERS.

Royal Air Force and Naval Aviation News and Announcements

Spot of comfort: The N.A.A.F.I. van dispenses the ever-welcome mugs of "char" at a fighter station equipped wfth Meteor IIIs. It will be gathered that the scene was *not* enacted during recent weeks.

SERVICE AVIATION

Appointments

THE Air Ministry announces the following appointments:—

Air Vice-Marshal Robert Mordaunt Foster, C.B., C.B.E., D.F.C., to be Assistant Chief of the Air Staff (Policy).

Air Vice-Marshal Kenneth Malise St. Clair Graeme Leask, C.B., M.C., to be Director-General of Servicing and Maintenance, Air Ministry.

Air Vice-Marshal Robert Owen Jones, C.B., A.F.C., to be Air Officer Commanding, No. 24 Group, Technical Training Command.

Air Vice-Marshal Foster has been Air Officer Commanding No. 3 Group, Bomber Command, since July, 1946, and was formerly Air Officer Commanding, R.A.F., Austria, and also Chief of the Air Division of the Control Commission for Austria (British Element), from August, 1945. He previously commanded the Desert Air Force, taking up that appointment in December, 1944, after having been Air Officer Commanding in Malta from March of that year. Before going to Malta he had been for six months on the Allied Military Control Commission, Italy.

Born in September, 1898, at Richmond, Surrey, he was educated at Winchester and the Royal Military College, Camberley, and was commissioned in the Royal Fusiliers in July, 1916, obtaining a permanent commission in the R.A.F. in 1919.

Air Vice-Marshal Leask has been A.O.C. No. 24 Group since January, 1944, and was formerly A.O.C. No. 43 Group, Maintenance Command, from November, 1940. For some years previously he was engaged on equipment (engineering) staff duties at Bomber Command headquarters.

Commissioned in the Devon Regiment in November, 1914, he transferred to the Royal Flying Corps in 1916 and was given a permanent commission in the R.A.F. in 1919, later qualifying at a specialist engineering course.

Born on October 30, 1896, at Stoke Damerel, Devonport, he was educated at St. Bees, Cumberland, and Victoria College, Jersey.

Air Vice-Marshal Jones has been head of the planning staff which was set up at the Air Ministry last April in connection with the formation of the new technical services organization of the R.A.F. Before then he was for nearly three years Deputy-Controller of Research and Development at the Ministry of Aircraft Production (afterwards merged in the Ministry of Supply). Earlier in the war he was with the British Air Commission in Washington.

Born in April, 1901, he was educated at Ashbourne Grammar School, Epworth College, Rye, and the College of Technology, Manchester University.

Canadian Sea Furies

A NUMBER of Hawker Sea Fury X fighters will be delivered almost immediately to the Royal Canadian Navy. These aircraft, to full British Admiralty specification, will have all available alternative equipment and armament. A. V. Roe (Canada), Ltd., will be responsible for any major maintenance and repair work.

R.C.A.F. Orders Transports

ROYAL CANADIAN AIR FORCE interest in the Merlin-powered DC-4M was mentioned in *Flight* of February 13th. It is now confirmed that twelve military versions, known as C-54 G-M, are in production at the Canadian factory. These are described as long-range freighters.

Airmen and Industry

AIRMEN who received war-time training in certain trades and completed five years' service in their trade are now eligible for admission as skilled men in certain engineering and allied civilian occupations. Their admission as fully skilled members of the appropriate trade union is a matter for negotiation between the airmen and the union concerned.

R.A.F. and W.A.A.F. Recruitment

IT has been found necessary, due to the fuel crisis, to suspend temporarily all direct entry from civil life into the W.A.A.F. This restriction does not apply to ex-airwomen who wish to re-enter the W.A.A.F. under the Extended Service Scheme. Regular recruiting for the R.A.F. and re-enlistment of men under the Bounty Scheme is not affected.

Reunions

The second annual reunion dinner of 83 Group will take place on March 28th (1900 hrs) at the Connaught Rooms, Gt. Queen Street, Kingsway, London, W.C.2. The chair will be taken by Sir W. M. Dickson, K.B.E., C.B., D.S.O., A.F.C., and the guest of honour will be Air Marshal Sir Hugh W. L. Saunders, K.B.E., C.B., M.C., D.F.C., M.M.

* * *

A reunion dinner and dance of 102 (Ceylon) Sqdn. will be held on May 10th at the Café Royal, Regent Street, London, W.1. Tickets one guinea each. Particulars from R. F. Gomm, 92, Forest Road, Loughton, Essex.

* * *

In preparation for resumed activities members of the Royal Air Force, Middle East, Dinner Club are requested to forward addresses and rank (to confirm or correct the register) to the Hon. Treas., R.A.F.M.E. Dinner Club, c/o Messrs. Nicholas and Dixon-Spain, 19, Hanover Square, W.1.

* * *

A reunion dinner for former members (male) of 619 Squadron will be held at the Connaught Rooms, Gt. Queen Street, Kingsway, London, W.C.2, on May 2nd, at 6.30 for 7 p.m. Tickets—17s 6d each—should be requested, not later than March 15th from P. S. Osborne, A. R. Heathcote and Co., Ltd., Bernard Works, Sheffield, 1.

Casualties

THE Air Ministry regrets to announce that a Dakota aircraft of Air Command, Far East, which took off from Changi, Singapore, on February 26th, 1947, to fly to Saigon, is missing. The occupants of the aircraft were:—

Passengers: Mr. J. K. Johnston; Mr. Eumitrescu; Brigadier J. H. Alms, Army; F/L. T. C. Taylor, R.A.F.; F/L. A. E. Darlow, R.A.F.; F/S. J. E. Bull-

SERVICE AVIATION

man, R.A.F.; Cpl. M. Anderson, R.A.F.; A/C.I. W. E. Jackson, R.A.F. Crew: F/L. H. D. Watson, R.A.F.; W/O. P. J. Hannington, R.A.F.; W/O. J. Bell, R.A.F.; W/O. L. Thomas, R.A.F. The next-of-kin have been informed.

Thanks from Denmark

THE British Minister to Denmark has received from the Danish resistance movement a gift of £4,000 to benefit the bereaved of eight R.A.F. men killed during raids on the Gestapo headquarters at Copenhagen, Aarhus, and Odense.

Meteor Production

THE size of an order for a military aircraft and the rate of production are officially secret, but *Canadian Aviation*, after a visit to the Gloster works, mentions an order for 400 and the production rate of four per week. The number of employees is given as 10,000 (compared with 30,000 during the war).

Sir Ernest Holloway Retires

SIR ERNEST HOLLOWAY, K.C.B., O.B.E., M.I.C.E., M.I.M. and C.E. Director-General of Works, Air Ministry, will retire on April 24th, 1947. Mr. G. H. Fretwell, M.I.C.E., has been appointed to succeed him.

Mr. Fretwell joined the Air Ministry Staff in 1928. After service at home and abroad he became a Chief Engineer in 1940, a Deputy Director of Works in 1945 and a Director of Works in 1946.

Sir Ernest Holloway, after service in the Forces in the 1914-18 war, joined the Air Ministry works staff in 1919. He became Director of Works in 1939 and Director-General in 1940 and was responsible for the control and carrying through of the vast building programme required by the R.A.F. during the war.

In connection with R.A.F. expansion, and in the construction of airfields for the U.S.A.A.F., he was responsible for the expenditure of between £600,000,000 and £700,000,000. In the peak year of 1942 some 127,000 building and civil engineering personnel out of a total of 393,400 available for the whole country for all departments were employed on Air Ministry contracts. At one period as many as 80 airfields were under construction and a new airfield was being completed every other day. In 1942, the peak year, the works undertaken by the Air Ministry cost £145,000,000—one thirty-second of the total National expenditure on the war in that year, or approximately one-sixth of a typical pre-war National Budget.

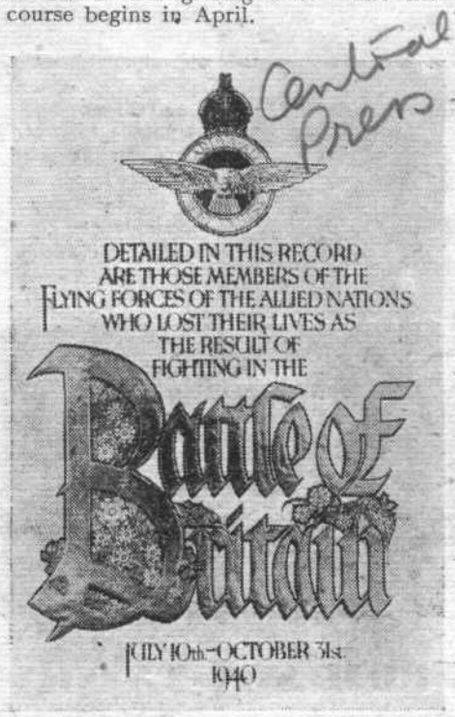
About 300 radar stations were built at a cost of £10,000,000 with accommodation for 77,000. Masts at some of these stations, either of timber or steel, ranged from 105ft to 360ft in height.

For his war services Sir Ernest was made a C.B. in 1941 and a K.C.B. in 1944.

A.T.C. Officers for Germany

A HUNDRED A.T.C. officers are to be given gliding instruction courses at gliding clubs run by the British Air Force of Occupation in Germany. Twenty chosen from A.T.C. units in England, Scotland, Wales and Northern Ireland, will fly to Germany for each two-week course. These will be held at the gliding club of 84 Group at Salzgitten, the B.A.F.O. Headquarters or No. 2 Group at Oerlinghausen.

All officers will be granted pay and allowances during their two weeks' stay in Germany. A charge of £8 will be made to cover the cost of meals, accommodation and gliding fees. The first course begins in April.



ROLL OF HONOUR: The title page of the embossed and illuminated Roll of Honour to be deposited in the R.A.F. Memorial Chapel in Westminster Abbey in commemoration of those who fell in the Battle of Britain.

Carrier Renamed

THE KING has formally approved a French proposal to rename the light fleet carrier, H.M.S. *Colossus*, which is on loan to the French Navy, the F.S. *Arromanches*. It was on the beaches of Arromanches that the first Allied troops went ashore during the invasion.

(Left) Badge of No. 278 Squadron, R.A.F. "Ex Mare ad Referiendum" (From out of the sea to strike again). (Centre) Badge of No. 214 Squadron, R.A.F. "Ultor in Umbris" (Avenging in the shadows). (Right) Badge of No. 654 Squadron, R.A.F. "Progressive."

A Dutch Heroine

UNTIL the summer of 1944 Coba Pulskens, of Tilburg, Holland sheltered Allied aircrew and aided their escape. At that time her house was raided by the Germans and three Allied pilots sheltering there were shot. Asked by the Germans for a sheet to cover the corpses Coba Pulskens handed them a Dutch flag. This same flag was used for the unveiling of a tablet to her memory (she met her death at Ravensbrück) at a recent ceremony attended by the Burgomaster of Tilburg, civic dignitaries, ambassadors, attaches and officers of the R.A.F., R.C.A.F. and R.A.A.F.

Frozen Asset

THOUGH the need for an R.A.F. Winter Experimental Flight in Canada might well have been questioned during recent weeks a Canadian correspondent assures us that the Flight is doing good work. Piston-engined and jet aircraft are constantly seen flying round Edmonton, apparently with no trouble, at temperatures of the order of −40 deg F.

White Paper on Defence

DEFENCE policy must be compatible with the restoration of a balanced peace economy, first because of the demands made on national resources by the Armed Forces, and secondly because, to be successful, such a policy must find its roots in healthy social and economic conditions. This precept is laid down in a statement of the present position relating to defence, part of the White Paper *Statement Relating to Defence* presented to Parliament last month.

Under the heading "Production Research and Development" the Air Ministry programme is stated to provide for the continuation of the progressive rearmament of the R.A.F. with the most modern types of jet-propelled fighter aircraft and for a start to be made on the replacement of American transport aircraft and the introduction of a modern type (presumably the Handley Page Hastings) for the carriage of airborne forces

Some provision is also made "for the replacement of obsolete training aircraft with modern types, a requirement of fundamental importance to the efficiency of the post-war Royal Air Force." In this connection it is already known that substantial contracts have been placed for Percival Prentices, but although other new types of trainer, including the turbine-powered Boulton Paul P.108, are known to be under development, no mention has hitherto been made of their adoption.

Reference is also made to the start in re-equipping the Naval Air Arm, which, during the war depended to a very large extent on American types of aircraft, and to the continued re-equipment of Anti-Aircraft Command with "the latest types of equipment."

Financial provision for the Royal Air Force for 1947-48 is 214 million pounds, that for the Army 388 million, and for the Navy 196.7 million. In referring to the Ministry of Supply figure of 100.3 millions it is pointed out that the charges

SERVICE AVIATION

for production for the Armed Forces will be borne on the rates of the respective Service Departments. Moreover, the M. of S. figures "are restricted to their estimated expenditure on research and development with related works services, to that proportion of certain inspection services provided by the Ministry which is regarded as appropriate to the work undertaken on behalf of the Service Departments, and to terminal payments in respect of war contracts."

FURY RECCE/FIGHTER

ONE of the earliest lessons learnt during the war was that the long established class of two-seater tactical reconnaissance aircraft had become obsolete. It was found that a single-seat fighter with good performance and handling qualities at low levels, flown by a well-trained and observant pilot and fitted with suitable cameras, could do a better job. Its high performance gave a higher degree of immunity to ground fire and interception and a greater number of sorties was possible in a given time. The photographic equipment, moreover, detracted little, or not at all, from its powers as a heavily armed fighter.

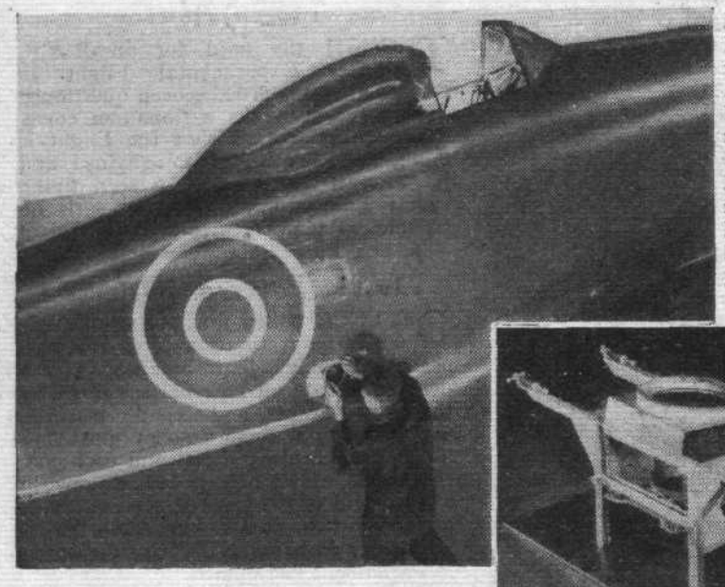
The importance of such aircraft was stressed by the late Air Chief Marshal Leigh-Mallory in his recently published despatch (see *Flight* of January 16th).

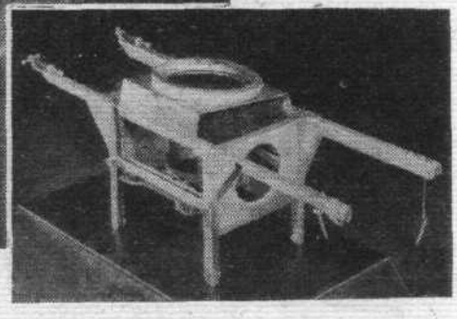
Whereas the Spitfires and Mustangs which did such excellent service during the war were adapted for reconnaissance, the Hawker Fury was designed from the outset with this rôle in mind.

Equipped for reconnaissance the Fury disposes two F.24 cameras, one for vertical, and the other for oblique photography. The lens of the vertical camera can be varied in focal length from 5in to 20in, and that of the oblique camera from 8in to 20in. The latter can be mounted to face either port or starboard and can be depressed from 0 deg to 20 deg below the horizontal. Thus all normal "photo recce" duties can be undertaken and the pilot's job is made easier than in certain other single-seaters by the high-mounted seat and the slight forward drop-away of the nose cowling behind the Bristol Centaurus engine.

Carrying two 90-gallon drop-tanks, the reconnaissance Fury has a range of over 1,900 miles, at a height of 10,000ft, and a cruising speed of 300 m.p.h. The full armament of four wing-mounted 20mm guns, with 580 rounds of ammunition, is retained.

Even this formidable array of equipment and tanks does not load the Fury to the limit of its capacity. In long-range armed fighter-reconnaissance condition the take-off weight is 13,615lb, whereas with two 1,000lb bombs in place of drop tanks and cameras the figure is 14,250lb.





PHOTOGRAPHIC FURY: The main view shows the stowage of the oblique F.24 camera, here mounted to starboard. In the smaller view the mounting for the vertical F.24 is shown. Focal length variation of 5-20in is possible.

FROM SEA TO SKY

TO his study of *Flight's* reports of the 1909 French trials Air Chief Marshal Sir Arthur Longmore ascribes his early interest in flying. Thus in some measure *Flight* may claim to have influenced the course of a career which, for variety of R.A.F. experience, can have few equals.

To the progress of this career, rather than to the expression of opinion or the propounding of military doctrine, Sir Arthur's recently published autobiography* is devoted. His memoirs inspire not by force of style of presentation but in being an unadorned record of a life which, for the greater part, has run parallel with the growth of a great fighting Service.

Sir Arthur was one of four Naval officers, out of five hundred applicants, who learnt to fly during 1911 in the Isle of Sheppey. Between this time and early 1916 he saw—and did much to assist—the initial growth of Naval aviation. After serving at Jutland (he had charge of a turret in H.M.S. *Tiger*) he joined the R.N.A.S. and was in Malta and Italy during 1918. He recalls some brave days in Irak and Great Britain in the years between the wars; two of these years (1930-32) he spent as Commandant of the R.A.F. College at Cranwell and two (1936-38) as Commandant of the Imperial Defence College. As an easily assimilated account of the development of the R.A.F. at this period the book is thoroughly recommended.

In 1939, prior to taking over Training Command, Sir Arthur accompanied Sir Hardman Lever and Sir Donald Banks on a mission to Australia and New Zealand to investigate the possibilities of aircraft production, and in the spring of 1940 he received his appointment as A.O.C., Middle East.

The splendid story of the air operations in the Middle East and Greece is straightforwardly—and forthrightly—told. An all-too-familiar tale of strained resources and of skirmishes with higher authority concludes with an account of the visit to England from which he was not to return to his Command. "My passage by air to Cairo via Takoradi had been arranged," he writes, "but the Fates decreed that I was not to return . . ." On the 19th of May, Sir Archibald Sinclair told him that Air Marshal Tedder's appointment in his place would be confirmed. "My personal feelings are better left to the imagination," he goes on. "It seemed that the change had already been planned when the signal recalling me to England for consultations had been sent. I received my G.C.B. from His Majesty and retired to the obscurity of my home at Grantham to await the next throw of the dice whilst the situation in Crete went from bad to worse."

As Inspector-General he found that it was unfortunate for his reputation that the announcement of the change of Command, Middle East, should coincide with the news of the fall of Crete. "It was not lack of air strength alone," he avers, "which lost us that island." But he found in his new appointment "how very healthy the R.A.F. really was."

By December, 1941, it seemed to Sir Arthur that there was a limit to his usefulness as an Inspector-General. There already existed a very efficient one (Air Chief Marshal Ludlow-Hewitt) and it was improbable that Sir Arthur would receive an active command. The Air Force List still showed too many Air Chief Marshals and he considered that it was time to make way for the younger Air Marshals and Air Vice-Marshals, many of them of high calibre and with a fine record of war service. The Air Ministry accepted his offer to retire and he left the active list at the end of February, 1944.

After unsuccessfully contesting a by-election he became a Major in the Home Guard. Visits to the U.S.A. and Canada followed and by the end of May, 1944, he reverted to the retired list. Having started the war as an Air Chief Marshal he finished it in the capacity of skipper of a motor fishing vessel with the relative rank of Chief Petty Officer. This fact, like so many incidents in his life, he found amusing.

In his retirement after so full and meritorious a life Sir Arthur can readily be forgiven for ascribing the Fury to Faireys, the Nimrod to the same company and for crediting the Cygnet with two engines!

* From Sea to Sky. By Air Chief Marshal Sir Arthur Longmore, G.C.V., D.S.O. Bles. 18/- net.

American press and impressions...

That the "Bristol" Freighter created an immense impression wherever it went during its tour of the Americas is amply proven by the mass of press reports continuing to arrive from these continents. Press support for a project of enterprise and initiative is an American characteristic; it is also a tribute to the fine job of work accomplished by the "Bristol" Freighter in its role of aerial ambassador.

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