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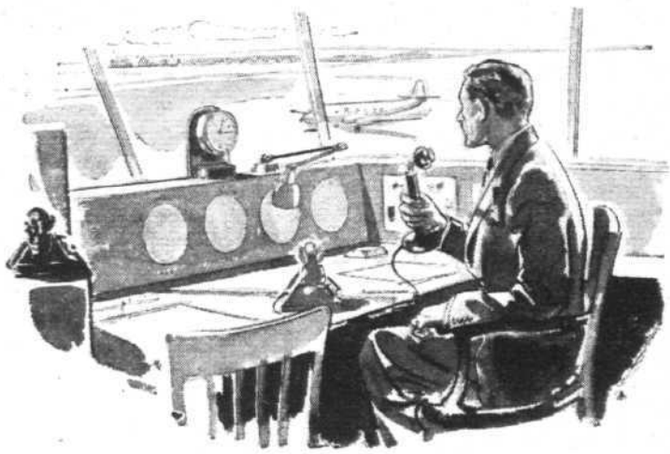

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In this issue:

The Flying Year

THE Garden Party of the Royal Aeronautical Society, described overleaf, was a delightful prelude to the 1950 flying season. Given fair weather, the aeronautical fraternity can now look forward to a long succession of displays, rallies and exhibitions transcending in spectacle, and certainly equalling in scale, any that come to mind from the past.

This abundantly promising year, we believe, will prove an especially happy one in marking a resurgence of the strength and spirit of the Royal Air Force, epitomized by the R.A.F. Display at Farnborough in July. How deeply this once-annual pageant has been missed by the Service and public alike is told in many a letter reaching this office, and with what keenness the squadrons are competing for the honour of performing in the first Display since 1937, may be judged from the account of the aerobatic contests in this issue.

In this business of flying we are unusually fortunate, in that events promoted out of purely commercial motives often afford unsurpassed entertainment. The classic example, of course, is the S.B.A.C. Display, for which Farnborough again is the setting this year. At least eight entirely new prototype aircraft should make their debut, in addition to the Avro Jetliner and possibly the CF-100 heavy fighter, which would constitute the first Canadian representation. Speeds and rate of climb unprecedented at public displays in this country are expected of research fighters, and it would not be altogether surprising if the North American Sabre's achievement of eight successive upward rolls were equalled or bettered. Certainly Britain's shop window of the air will be fittingly dressed, though our French and Belgian friends, with their displays at Brussels, Antwerp and Orly, are vying with us.

Of the purely sporting events the greatest interest attaches to the King's Cup Race, to be flown some four weeks hence over the Wolverhampton circuit. The Kemsley, Siddeley, Norton Griffiths and Grosvenor events are other notable contests of a sporting year, to be further enriched by rallies at home and in alluring Continental surroundings. The presence of such names as Champagne, Cognac, Cannes, Anjou, Roussillon, Deauville, La Baule and Touraine in the list of pleasures to come assures sportsmen pilots and air tourists of a vintage year indeed!

For the military *haute école* there are the impressively titled International Military Air Pentathlon in France and the International Squadrons Competition at Ypenburg, in Holland. Could anything strengthen the comradeship of military pilots more than these 20th-century counterparts of the medieval tournaments?

This year of pageantry, recreation, sport and commercial display will bring manifold opportunities to enhance the reputation of British aircraft. Our demonstration pilots are second to none, and given the necessary salesmanship and showmanship behind the scenes (it must be admitted that in this respect we have not always been up to the mark), the flying season now in progress should prove stimulating, profitable and enjoyable to all concerned.

Record Prospects

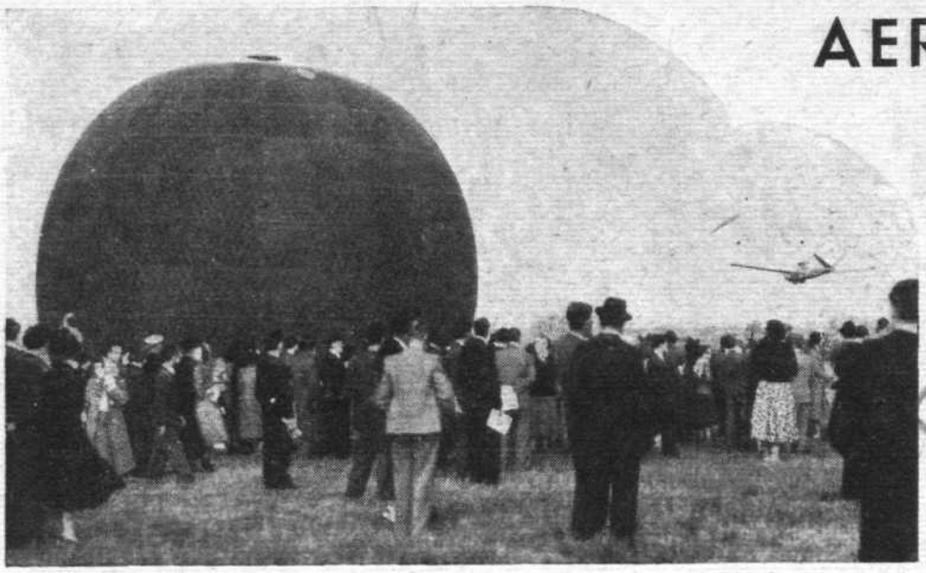
IN the field of record-breaking, too, Britain, has high hopes this year—has, in fact, already made an excellent start. The news of Jim Cooksey's fine achievement over the 1,000-km course, recounted on p. 627, coincided with official homologation of no fewer than five inter-city records, by Neville Duke, John Cunningham (with Peter Bugge) and Janusz Zurakowski, accomplished respectively in the Fury piston-engined fighter, Comet jet airliner and Meteor 8 jet fighter.

Now that Cooksey in the Meteor 8 has bettered the performance of the American Lieutenant H. A. Johnson, who flew a Shooting Star, it would not be in the least surprising if other British fighters—possibly the D.H. Venom and Hawker P.1052—were progressively to raise the new, unconfirmed, figure of 510.925 m.p.h. In 1948, it may be remembered, the vogue among the jet fighters and research aircraft was closed-circuit record breaking. This year the competitive emphasis may be on speed over relatively long distances.

AERONAUTICAL and SOCIAL

Past, Present and (Perhaps) Future Light Aircraft at R.Ae.S. Garden Party

Illustrated with "Flight" Photographs



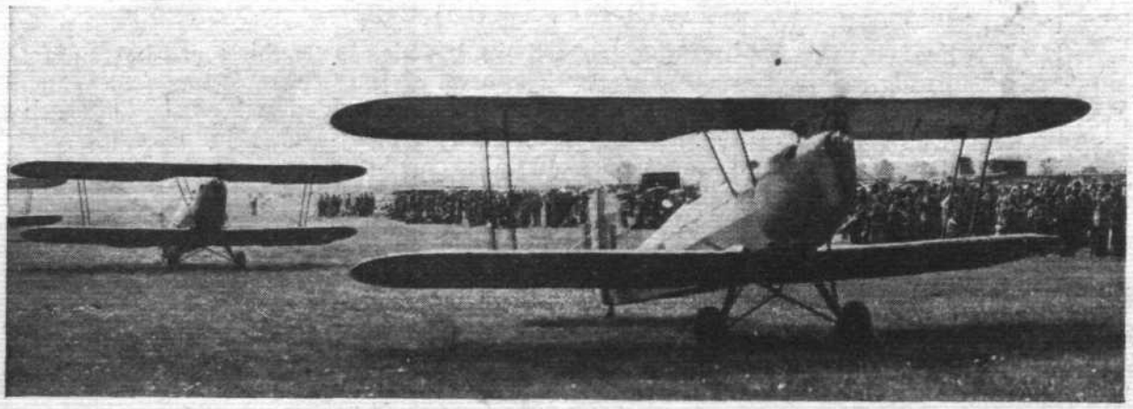
Together—but fifty years apart: The crowd's interest is for a moment transferred from the balloon to the jet-propelled Fouga Cyclone.

ALTHOUGH the sun shone brightly enough when not masked by fast-moving patches of strato-cumulus, any warmth that it gave was more than offset by the fresh, indeed gusty, breeze out of the north-east. Ladies who brought coats to cover their summer dresses wore them gratefully; nevertheless, Sunday, May 14th, will be remembered happily by very many people as one of the most pleasant Garden Parties the Royal Aeronautical Society has held.

The theme of the occasion this year was accented, with one or two exceptions, on light and private types of aircraft, few of which—more's the pity—were less than 12 years old. There was, however, a heartening number to be seen, and among those engaging sustained interest were the Fougar Cyclone, the British-built Hoppi-Copter, and the extraordinary Hurel-Dubois with its aspect ratio of 36. Complementing the full-size types was perhaps the largest collection of scale-model aircraft to have been exhibited under one roof in this country.

John Fricker showed to advantage the extraordinary capabilities of the Zaunkoenig and, helped certainly by the 20 m.p.h. wind, was observed in transit with a tree on the skyline for fully ten seconds. With its Le Rhône rotary sounding delightfully smooth and quiet, the Shuttleworth Collection Sopwith Pup was flown by G/C. A. H. Wheeler, and looked far more modern than its 1916 vintage would give one to believe. Proud in its coat of Sopwith blue, with gold-bronze spinner and registration, *The Last of the Many* Hurricane was beautifully shown off by Trevor Wade.

Probably the high spot of the flying entertainment for many people was the superb display of aerobatics by the Exhibition Squadron of the French Air Force in their Nord Stampe S.V. 4os. Commandant Perrier was the individualist and he went through a whole gamut of manœuvres, in the intervals of which his three compatriots followed his lead with both *eclat* and *elan* and, moreover, in the most breath-takingly tight formation. We have not the space to run through their repertoire and must content ourselves merely



(Above) The resuscitated Hawker Cygnet, winner of the 1926 light plane competition, coming in to land.

(Centre) Comdt. Perrier of the French Squadron performing solo aerobatics.

(Left) The French Squadron taxi past the crowd to receive a well-deserved cheer.

Left: The Zaunkoenig tries to emulate a helicopter. Below: The Hurel-Dubois was an interesting study in span loading.

M. Bugerhout bringing in the Fokker S.12 at the conclusion of his demonstration.

Capt. J. Laurence Pritchard, retiring secretary of the R.Ae.S.

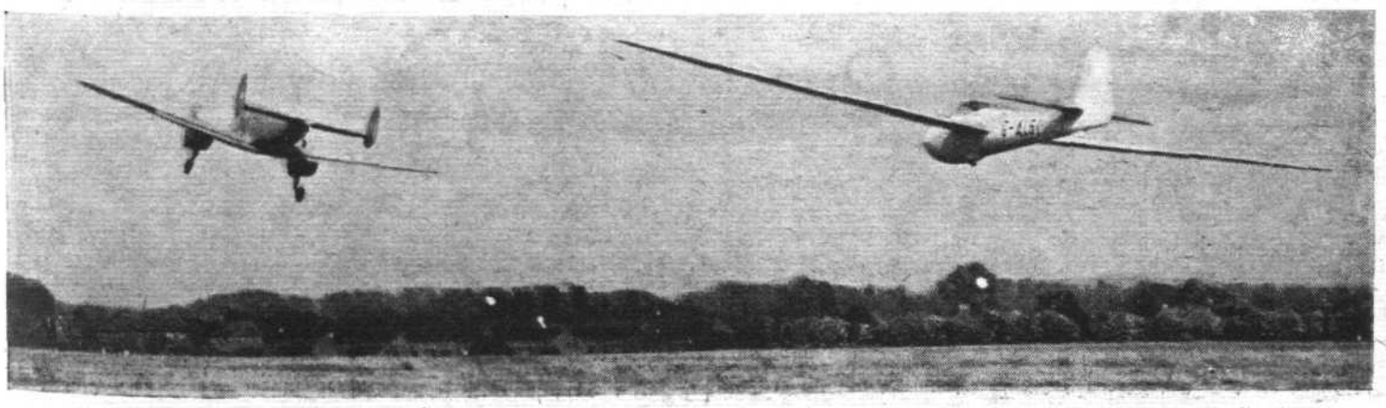
with saying that stall turns in line-abreast and bunts in close-vic are sights not to be forgotten. M. Perrier also performed a manœuvre which we do not recollect ever having seen before, namely, an outside slow roll, i.e., with the pilot on the outside.

Mr. J. O. Mathews flew the Fairey Junior in an astonishing series of tight turns at about 100ft over the crowd, and Ranald Porteous manhandled his Auster with 20 deg of simultaneous bank and yaw with one wheel of its Goodyear castering undercarriage on the ground. The aerobatics for which Mr. L. C. Marmol is now renowned were given in his Lunak L.107 sailplane and earned for him a burst of merited applause. The Hawker Cygnet (Sidney Camm's first effort) proved recalcitrant in starting, but Mr. Hayward—who, on and off, has been swinging its airscrew since 1924—finally prevailed, and Mr. Murphy took off.

Maurice Hurel displayed his Hurel-Dubois in a fashion calculated to allay the fears that its fantastically slim wing aroused in beholders, but no one feared for the Fouga Cyclone which, with its Turbomeca Piméné turbojet giving 242 lb of thrust, whistled sweetly about in a most entrancing manner. We envied M. Leon Bourrieau his aircraft.

It was too windy for the really ancient types to fly, but the 1912 Blackburn monoplane did a short run from the leeward boundary back to its parking place, and then, as the parthian effort M. Charles Dollfus, together with Mrs. Pritchard, Peter Masefield and Charles Brown, went ballooning. After a flight of some 20 miles, the intrepid aeronauts were restored to Mother Earth in a crop-sown field not far from Reading.

Left: The Fouga Cyclone on its way out to the take-off point. Below: M. Marmol on his Lunak sailplane being towed to height.



"Flight" photograph.

Experienced eyes: Air Marshal Sir Basil Embry (centre) and A.V-M. D. F. W. Atcherley selected pilots for aerobatic events in the R.A.F. Display. With them (left) is S/L. T. F. Neil.

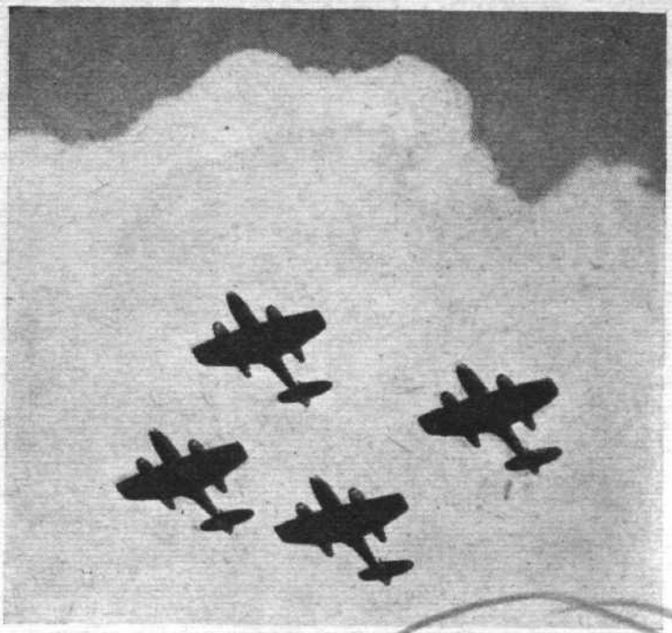
PICKING THE PILOTS

Preparations for the R.A.F. Displays: Aerobatic Contests at Tangmere and North Weald

As they taxied their Meteors, Vampires or Hornets towards the runway in use, most of the pilots who flew from Tangmere on May 9th cast quick professional glances to the sky, in final assessment of the manœuvres in execution by colleagues overhead. The occasion—the final eliminating contests to select aerobatic exponents for the R.A.F. Display in July—produced both keen competition and a critical audience; and the weather was sufficiently warm and sunny to render the spectacle colourful and pleasant, although haze was no help to competing pilots.

In the judges' enclosure were the Air Officer Commanding-in-Chief, Fighter Command, Air Marshal Sir Basil Embry, and his recently appointed Senior Air Staff Officer, A.V-M. D. F. W. Atcherley. On the score of personal participation in pre-war Hendon Displays alone, the judges were particularly well qualified. With the aid of a low-power V.H.F. "pack-set," they were able to select manœuvres, or order repetition of movements performed, during each pilot's display.

Sir Basil Embry and A.V-M. Atcherley looked for five major points of demonstration in making their selection: positioning, in relation to sun and spectators; cleanliness of aerobatic movement; accuracy of flying; "zip"—a rather intangible quality depending largely on continuity of performance; and originality, which was more easily assessed. And in formation events, of course, station-keeping was a cardinal consideration.



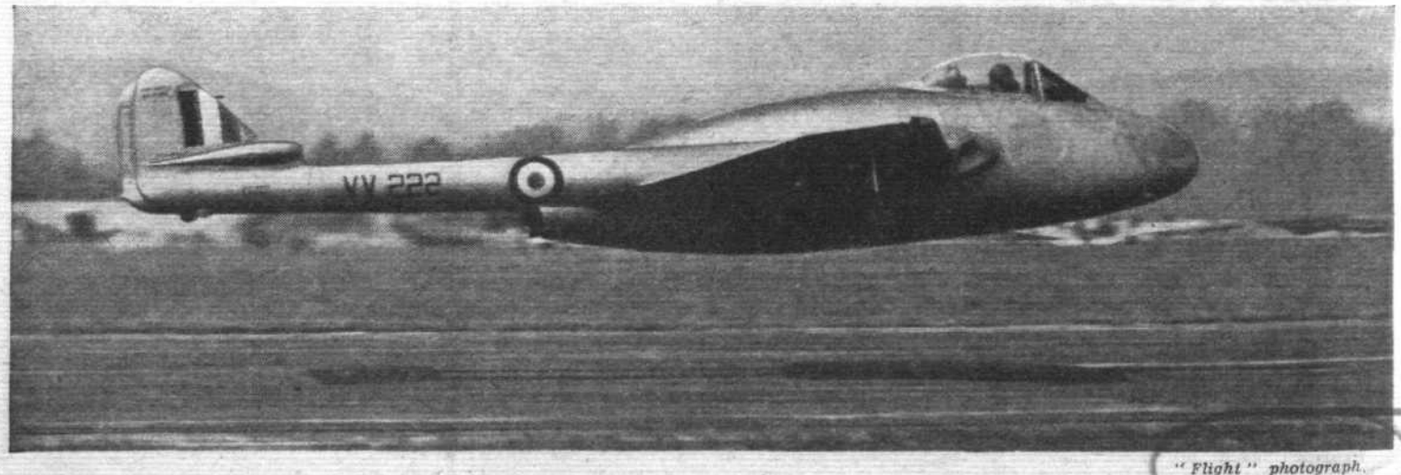
"Flight" photograph.

Classic formation-flying by four Fighter Command Meteors.

Event 1 comprised six five-minute displays of Vampire aerobatics, given by pilots selected from Maintenance Command, 11 Group (two representatives), B.A.F.O., the Central Fighter Establishment, and 12 Group. All pilots flew the latest Vampires—Mk 5s with abbreviated span. The chosen pilot was F/O. G. H. "Nick" Carter of 247 Squadron—a particularly deserving winner. F/O. Carter, when awarded the A.F.C. in the 1948 New Year Honours for a series of fine individual Vampire demonstration flights, had then been released from the Service. After some two years' absence from flying he returned to his old unit last September, and is now evidently back on his top aerobatic form. For all individual events, "stand-in" pilots were selected to train for the Display should the first choice be unable to appear; a C.F.E. pilot was runner-up in the first item.

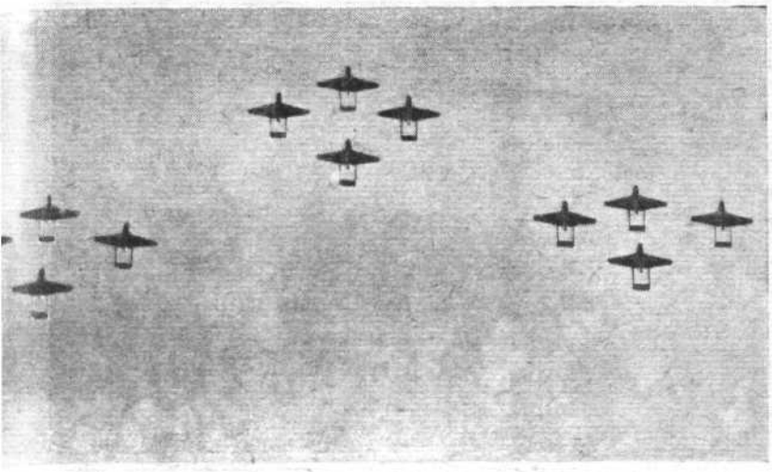
Individual Meteor aerobatics, by pilots of 11 and 12 Groups, Maintenance Command and Flying Training Command, formed the next event. F/L. R. Emett, from 203 Advanced Flying School, gained highest marks. His victory, one felt, was won by sheer aerobatic finesse in the teeth of very strong competition from F/L. Lynes, of 12 Group, whose display—for showmanship and excitement—was not equalled during the afternoon. Other entrants relied too much on speed alone and tended to vanish in the haze for over-long periods.

Three four-pilot teams, two from 12 Group and one from 11 Group, took part in the first formation contest, flying Meteors. Although their aircraft are not, perhaps, quite so well suited for the purpose as the Vampires more frequently seen demonstrating formation aerobatics, all three teams gave excellent performances and final selection must have been difficult. Honours went to No. 263 Squadron, 12 Group, the pilots being S/L. Foster, D.F.C., F/L. Hart, F/L. Jenkins and F/O. Latham.



"Flight" photograph.

Intimate view of a Vampire 5 taking off for an individual display. The 54 Squadron formation is illustrated on page 629.



"Flight" photographs.

The Vampire 3s of Nos. 601 and 604 Auxiliary Squadrons performing their squadron drill at North Weald. On the right are the two pilots who tied in the individual-aerobatics competition: F/L. C. Hulse (Balliol 2) and Plt. I K. Posta (Spitfire 16).

It was not unexpected that the "transatlantic" 54 Squadron should take first place in providing a Vampire aerobatic team. Once again we saw the flawless formation loops and rolls and deft station-changing, performed this time with five aircraft instead of the usual four. The winning team consisted of F/L. Bennett, F/L. Bowie, F/L. Sloane, P/O. Clay and F/O. Minnis. Nevertheless, their opponents, four pilots from B.A.F.O., put up healthy opposition which would have honoured any display.

Synchronized aerobatics—in which two aircraft took off together, parted and executed simultaneous movements in opposite sectors of the sky—constituted the final event. No. 12 Group provided the only airscrew-driven entries, two pairs of Hornets, and the third pair, Meteors, came from 11 Group. Interest in this form of demonstration tends to fall off if the aircraft operate too far apart—an innate disadvantage which only very careful ground planning can overcome.

One of the highlights of the event was a pass across the airfield from opposite corners by the two winning Hornets (piloted by F/O. Hutton and Plt. II Sherburn of 65 Squadron), each with one Merlin feathered, followed by a roll on climb-away.

Looking back on the afternoon, we felt that, impressive as the show had been, there remained room for more variety and originality, both in individual and team performances. Now that pilots have been definitely selected, however, pre-Display practice will doubtless produce some new variations on routine themes of demonstration.

CONTESTS AT NORTH WEALD

THE same two senior officers, assisted by the A.O.C.s of Nos. 11 and 12 Groups, acted as judges on Saturday, when further eliminating contests were flown at North Weald, mainly between representatives of the two groups. On this occasion, in perfect weather, an assortment of units put up piston-engined aircraft for individual aerobatics and two London Auxiliary squadrons (11 Group) competed in air drill against three from the North Country (12 Group).

The individual aerobatics varied as much in style as they did in type of aircraft. S/L. R. L. Colston, in a Bomber Command P.R.U. Spitfire, offered a clean-cut performance ending in some four-point rolls of perfect precision, and Plt. II E. J. Tanner, representing 11 Group in a Spitfire of No. 615 (County of Surrey) Squadron, followed with an equally distinctive contribution. Favourable comment from Service lookers-on greeted six minutes of very dashing aerobatics by a Mosquito from No. 15 M.U., in which F/L. G. L. Auty was representing Flying Training Command. He must have been working very hard indeed, for we have seldom seen a twin put through more spectacular paces; he ran practically the whole aerobatic *gamut*, including three successive loops, rolls off loops, stall turns and a beautifully judged slow roll. In some of the more *g*-generating manœuvres fuel could be seen spraying from the Mossie's outer tanks, as if in imitation of the compression-vortices that a few of the faster aircraft produced.

Flying Training Command sent F/L. G. Hulse, of the C.F.S., who exhibited a distinctive style of close-knit aerobatics that the agility of his Balliol 2 made possible; very pretty were some "Cuban Eights" involving vertical half-rolls.

The individual contests were wound up by 12 Group's contribution, made by Plt. I K. Posta of No. 17 A.A. Co-op. Squadron in a Spitfire 16. An aerobatic expert in Czechoslovakia before the war, he exhibited a strikingly individualistic style with slow rolls as a basic theme. Whether or not a somewhat skittish landing off a sideslip earned him a black mark we know not, but he was eventually adjudged to have tied with the Balliol pilot on points and will fly at Farnborough with the latter standing-by as reserve.

For the squadron air-drill, twelve Vampire 3s were put up for 11 Group by Nos. 601 (County of London) and 604 (County of Middlesex) Squadrons, led by S/L. P. H. M. Richey, C.O. of 601. They were opposed by an equal number of 12 Group Spitfires, from No. 610 (City of Chester), 611 (West Lancashire) and 613 (City of Manchester) Squadrons, under the command of S/L. J. B. Wales, C.O. of 613. The formations flown were the usual ones seen in squadron air drill.

The jets were somewhat disappointing, not so much on account of their station-keeping—though one or two formations were spoilt by the "odd man out"—but because they necessarily had to vanish from sight for long intervals. The Spitfires put in some gloriously compact work, particularly in a squadron vic with "two in the box." Eventually this event, also was adjudged a tie, and it was decided that both teams should perform at Farnborough, the Spitfires being dovetailed-in to fill the gaps between the goings and comings of the jets.

There were also some non-competitive events. Two Chipmunks of Reserve Command's Instrument Training Flight (F/L.s J. Dagleish and W. H. Johnstone), entertainly performed synchronized aerobatics; five No. 72 Squadron Vampires (led by S/L. D. E. Kingaby) displayed some magnificent "five as one" formation evolutions; and F/L. Patterson, an instructor to the Auxiliary squadrons at North Weald, showed what can be done with a Mk. 7 Meteor.

COPYING-MACHINE FROM CANADA

A MACHINE for the reproduction of three-dimensional surfaces to any desired scale has been developed by A. V. Roe Canada, Ltd., primarily in connection with the manufacture of blades for gas turbines. It consists of a master table and a work-table connected by a pantograph linkage which governs the scale of reproduction. An overhead reduction lever carries a tracer wheel at its outer end and a ratio-related cutting medium (such as a grinding wheel) towards its fulcrum end.

The master pattern, usually made of plaster, is caused to move in two planes so that the tracer wheel contacts the entire surface during its passage, while simultaneously the workpiece is being moved in a like manner except that distance is in accord with the ratio prescribed by the pantograph. The third dimension, or rise and fall, is transmitted from the tracer wheel to the cutter by the medium of the overhead lever.

The machine now in use has a reduction ratio of 10 to 1 and the workpiece when completed is therefore available as a master of extreme accuracy for 1:1 quantity reproduction. Forging and coining dies, forging trim dies and punches, contour templates and various other patterns in wood or metal may be produced on this machine: the device can, in fact, be adapted to produce enlarged copies of a master pattern in those instances where a proportional increase in the dimensional error is of minor importance.

This machine is available for licensing through Canadian Patents and Development, Ltd., of Ottawa.

HERE and THERE

To See for Himself

THE Australian Minister for Air and Civil Aviation, Mr. T. W. White, D.F.C., began last Monday a two-week tour of British aviation centres, having expressed hopes of flying in the Comet, Brabazon and other British types. "To keep up to date in the air," said Mr. White, "we must know the British picture thoroughly. I want to ensure that Australia has the very latest in both defence and civil machines." His first port of call was the D.H. works at Hatfield.

Shackleton—A Note on Noise

IN the description of the Avro Shackleton, which appears in the photogravure pages of this issue, the suggestion is advanced that the cockpit noise-level might be substantially reduced if thicker Perspex were used for the side windows and if Rolls-Royce cross-over exhaust manifolds were fitted. Hardly had the pages concerned gone to press when news came of a decision to incorporate these very improvements in production Shackletons for Coastal Command. Thus, the comfort of the cockpit will approach more nearly the unusually high standard set by the rest of the crew accommodation.

Air Minister's Forecast

DURING a recent visit to the R.A.F. bomber station at Waddington, Mr. Arthur Henderson, Secretary of State for Air, told aircrews that a new British four-jet bomber was on the way. This, it was hoped, would place Britain in the forefront of bomber development. Mr. Henderson appreciated Bomber Command's disappointment at having to use foreign aircraft (a reference to the B-29) but we had to realize, he said, that it was in our own interest to have very close relationships with the U.S.A. The B-29s would be used during a transitional stage pending re-equipment with a more advanced bomber.

"Flight" photograph.

TOWN HOUSE: For London members of the R.A.F.V.R., the new Reserve Centre in Hallam Street, W.1., will provide excellent training and recreational facilities with a minimum of travelling. The Centre was opened last Friday by the Under-Secretary of State for Air, Mr. Aidan Crawley (fourth from right); with him are seen (left to right) Air Marshal R. M. Foster, A.O.C.-in-C., Reserve Command, Air Marshal Sir William Dickson, Air Member for Supply and Organization, and S/L. D. C. Colebrook, C.O.

King's Cup Amendments

SOME amendments to the King's Cup Race entries (published in *Flight* of May 4th) were notified by the R.Ae.C. last week. Entries No. 15, R. A. Walley (Hawk Trainer) and No. 17, Lady Margaret Stewart (Miles Whitney Straight—pilot, L Rumbold) are withdrawn; No. 22 (the Miles M.18 to be flown by R. Porteous) is transferred from entrant R. G. Pilkington to T. W. Hayhow; and No. 26, Lt. Cdr. J. G. Crammond's Parnall Heck, is to be flown by R. G. Kent instead of by the entrant.

R.Aux.A.F. Air Race

ON the first day (July 7th) of the R.A.F. Display at Farnborough, Meteors, Vampires and Spitfires of the Royal Auxiliary Air Force will compete for the Cooper Trophy. They will fly two laps of a 36-mile rectangular course, and will be handicapped according to their official performance figures. When the display is repeated on the following day, auxiliary air drill will replace the race.

Finalists will be drawn from the first five pilots in the preliminary heat at Linton-on-Ouse on June 4th, and the first three in the heat at West Malling on June 11th. The Linton heat will decide representatives for the 13 Auxiliary squadrons in Fighter Command 12 Group; pilots from the seven 11 Group squadrons will be chosen at West Malling. Last year the competition was held during the National Air Races at Elmdon; the winner was F/L. Bowden of No. 502 Squadron, flying a Spitfire.

In Smaller Packets

DEVELOPMENT of a new type of casing is reported to have permitted the production of smaller atomic bombs, capable of being carried by jet bombers and fighter-bombers. The new bombs, according to a Washington source, are "not necessarily less powerful" than the weapons used against Hiroshima and Nagasaki, despite the decrease in size.

Modernized Thunderjet

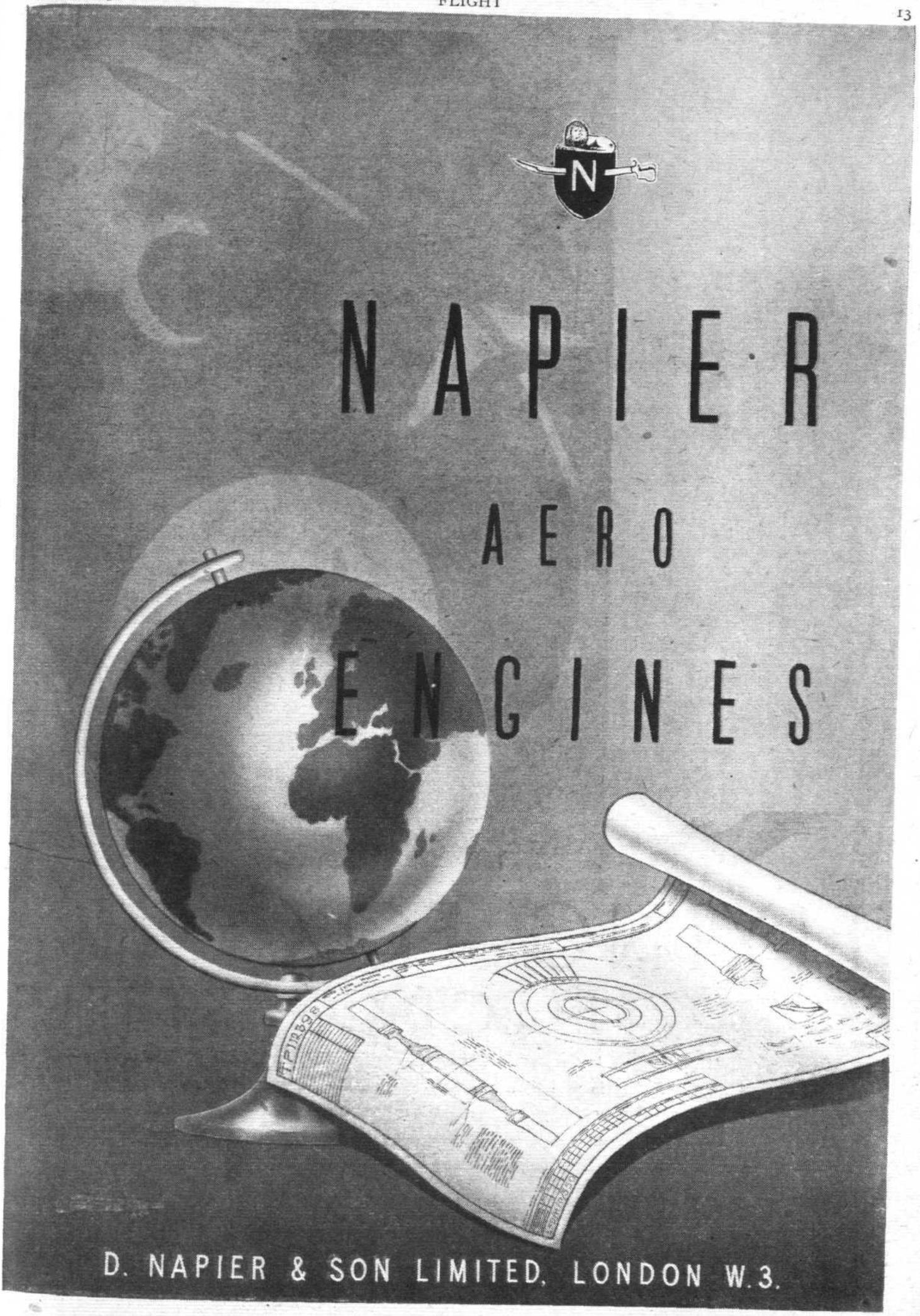
DESIGNATED YF-96A, a new fighter has been developed from the Republic F-84 Thunderjet and is now ready for initial flight tests. In fuselage form, it retains the straight-through induction system and overall appearance of the F-84, but swept-back, square-cut wings and tail unit have been added, and the design performance is considerably higher. The YF-96A's main undercarriage assembly, retracting inwardly into the wings, is of unusually wide track. The power unit is an Allison J-35 turbojet.

Civil Census

A RECENT survey made by the American Civil Aeronautics Board shows that 15 per cent of the transport aircraft used by the world's scheduled airlines (excluding those in Russia) were manufactured in Britain. America has produced 78 per cent of the 3,775 aircraft included in the survey.

This total includes no fewer than 1,095 DC-3s—far and away the most widely used type. Next on the list

FROM THE SOUTH WEST: The S.O. 6025, latest product of the Société Nationale de Constructions Aéronautiques de Sud-Ouest, and a direct development of the S.O. 6020 Espadon, displayed in the Paris Salon last year. This fearsome-looking machine has a booster rocket in addition to the Hispano-Suiza Nene turbojet.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HERE AND THERE . . .

comes the Douglas DC-4, 143 of which are in service. Britain achieves third, fourth and fifth places with the Vickers Viking (92), Avro Anson (77) and de Havilland Rapide (76).

Privateer Theory

FOLLOWING examination of two rafts and a wheel identified as having belonged to the Naval Privateer aircraft lost since April 8th, the U.S. Navy has stated that the machine exploded in mid-air or on impact with the water. No bullet-holes were found and the rafts showed no signs of use.

Home and Away

MR. JOHN W. TRURAN, Ministry of Supply west coast representative in the United States, has returned to England to resume permanent duties after completion of his two-year term in Los Angeles. John Truran served in the R.A.F. at Boscombe Down during the war, finishing with the rank of wing commander and an A.F.C. After the war he remained at Boscombe as Senior Handling Technical Officer, a civilian post.

Mr. Truran's successor on the west coast is Mr. J. C. K. Shipp, who also comes direct from Boscombe, where he was head of the Civil Aircraft Testing Section. Mr. Shipp joined the Airworthiness Branch of the R.A.E. at Farnborough in 1936 and served during the war in the Ministry of Aircraft Production before joining Boscombe Down.

International Aerobatic Contest

"MILITARY groups, clubs, works, firms or schools" are all invited to enter teams for the annual formation-flying and aerobatic competition of the Royal Netherlands Aero Club, to be held at Ypenburg on July 29th. The contest is in two parts: level formation flying and formation aerobatics; teams are to consist of three similar aircraft of any type. Entry forms and further details may be obtained from the Royal Aero Club Aviation Centre, Londonderry House, 19, Park Lane, London, W.1.

DANGER IN SAFETY: This Mark 8 Meteor, of the type now being produced for Fighter Command by the Gloster Aircraft Company, carries a warning notice for pilots and ground crew alike. The notice indicates that the Martin-Baker ejector seat is "live", and has a rack for two extra cartridges.

"All-in" Rally

ALL forms of transport—from light aircraft to bicycles—will take part in an international rally in Namur, Belgium, from June 9-11th, to be held in connection with the third Wallon Fair. Details are available from the secretary, P. J. Guillitte, 1, Chemin de Halage (Pont Evêché), Namur.

Mid-Pacific Missile

THE U.S. Navy's experimental guided-missile ship *Norton Sound* recently began a 29-day Pacific cruise during which it is scheduled to launch, from a point on the Equator, a Martin Viking upper-air research rocket. It is hoped that the missile, which carries instruments to investigate cosmic radiation, will reach a greater height than the two Aerobees launched from the *Norton Sound* in March, 1949.

On that occasion, the smaller rockets achieved an altitude of more than 65 miles. A Viking launched at White Sands, New Mexico, a year ago ascended 51½ miles. The greatest height ever attained by a rocket is 250 miles, reached by a WAC Corporal missile launched by a V-2 114 miles above the earth.

MILITARY VISIT: A party from the Imperial Defence College recently visited the Bristol Aeroplane Company. Capt. B. Bryant, D.S.O., D.S.C., R.N., is seen with Mr. W. Farnes, sales manager of Bristol's Aircraft division, and discussing the Brabazon 2 mock-up in the background are Brig. L. P. Sen, D.S.O., Indian Army, and Mr. W. C. Glennie, Board of Trade representative.

NEWS IN BRIEF

THE Aero Golfing Society is to play its annual match against the A. and A.E.E., Boscombe Down, at High Post Golf Club on Saturday, June 10th.

* * *

Vickers-Armstrongs, Ltd. (Broadway, London S.W.1), have published a finely illustrated and informative brochure—*Opportunity for a Planned Career*—dealing with their apprenticeship schemes which offer a choice of careers in shipbuilding, engineering and aircraft.

* * *

Next Saturday, May 20th, a paper on "Under-wing Refuelling," by J. Raynard, will be read before the Society of Licensed Aircraft Engineers, at 3 p.m. in the lecture hall of the Royal Society of Tropical Medicine and Hygiene, 26, Portland Place, London, W.1.

* * *

A party of 60 employees of the Hymatic Engineering Co., Ltd., recently visited Hatfield to see for themselves how the compressors and other pneumatic equipment which they make are used in de Havilland aircraft.

* * *

The Women's Engineering Society announces that the final date for receiving applications for the Women's Legion Scholarship in Aeronautical Engineering has been postponed until May 31st. Details are obtainable from the W.E.S. at 35, Grosvenor Place, London, S.W.1.

* * *

As a postscript to our story (April 20th) of the memorable 1910 London-Manchester contest, the Renold and Coventry Chain Co., Ltd., give the information that M. Paulhan stored his Farman biplane at their Burnage Lane works after the flight.

* * *

In our "In the Air" appreciation of the Percival Prince, published last week, reference was made to an American report that nine Princes had been ordered by the Shell Company. This report is now known to be incorrect. Three have been purchased by Shell, two of which have already been delivered to Shell Caribbean, in Venezuela. The third—for Sarawak Oilfields, Ltd.—will be delivered to Borneo within a few days.

SPEED, SAFETY, ECONOMY

Shorter Take-offs, Slower Landings, Cheaper Airports : Sir Frederick Handley Page's Louis Bleriot Lecture

Sir Frederick Handley-Page with (left) Ingénieur en Chef Pierrat, who read the lecture ; M. Bréguet ; Sir John Buchanan and Capt. J. L. Pritchard of the R. Ae. S. ; M. Jarry, president of A.F.I.T.A.; and A. Cdre. F. R. Banks, who delivered the 1948 Lecture.

SOME unorthodox but intriguing approaches to certain basic problems in the design of fast commercial aircraft were suggested by Sir Frederick Handley Page, C.B.E., F.R.Ae.S., when—as we briefly reported last week—he delivered the 1950 Louis Bleriot Lecture before a meeting of the A.F.I.T.A. (the French counterpart of the R.Ae.S.) in Paris on May 4th.

In these days, when the airline passenger is being invited to contemplate the near-at-hand benefits of 500 m.p.h. transit—benefits which he may not be inclined to accept unreservedly—a serious examination of the problem of reconciling speed with safety is clearly of the greatest importance. The problem, of course, occurs in its most acute form at the moments of take-off and landing, and it was with these aspects, involving as they do the subject of economy in airport layout, that the paper (a summary is given in these pages) was largely concerned.

At a banquet held in the splendid ballroom of the Aéro Club de France following the lecture, the president of A.F.I.T.A., M. Jarry, spoke of the extreme value of such close liaison between the Aeronautical Societies of the two countries. This, he said, was equally a mark of Franco-British solidarity.

On the subject of aircraft construction, he stressed the need for even closer co-operation, possibly to the extent of an interchange of results achieved with prototypes, so that duplication of effort could be avoided and development furthered on types which would benefit the community of the two nations.

For the benefit of the largely French audience, the lecture itself was ably translated and read in French by Ingénieur en Chef Pierrat, Chef de la Section Avions au Service Technique de l'Aéronautique.

Introducing its subject, Sir Frederick's paper referred to the spectacular increases in aircraft speeds, with their attendant requirements for reduced aerodynamic drag, which had been achieved during the last few years. This had led to smaller wings, increased wing loadings, higher stalling speeds and, consequently, longer runs for take-off and landing. The way in which wing loadings had increased in the past 20 years was indicated in a table (reproduced below) of comparative data on the Hannibal-class aircraft of 1930 and the Hermes IV which is to go into service with B.O.A.C. Throughout the world it had been tacitly assumed that an increase in landing speed caused by increased wing loading could be tolerated and that, if necessary, runways would be lengthened to suit. The last war had made possible the rapid creation and extension of runways which hitherto had been considered uneconomical. Citing the capital cost of some of the present large civil airports such as London (£26,000,000), Idlewild ($110,000,000) and Pistarini, Buenos Aires ($210,000,000), Sir Frederick pointed out that there must be a limit to this large-runway policy as few countries could ever afford to extend smaller runways, much less build airports to such a standard.

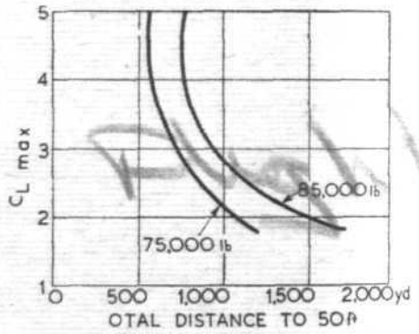


Fig. 1. As shown here for the Hermes at two weights, a considerable reduction in take-off run can be achieved by increasing the maximum coefficient of lift.

One of the objects of his paper was to draw the attention of operators, designers and airport authorities to the mounting capital and upkeep costs which must be borne as part of the price for air operations. Additionally, Sir Frederick reviewed several design developments which might simplify some of the basic problems of airport and airline operators. He thought that attention must now be given to extension of the lower end of the speed range. Not only would lower landing and take-off speeds provide additional safety, but, in poor visibility, the pilot of a slower aircraft would take fewer risks, because the time interval to meet emergencies would be lengthened. Lower minimum flying speeds would reduce the use of alternative

AIRLINER CHARACTERISTICS, 1930-1950

	H.P. Hannibal Imperial Airways (London-Paris) 1930	H.P. Hermes IV B.O.A.C. (Empire routes) 1950
All-up weight (lb)	28,500	82,000
Take-off b.h.p.	4 x 550	4 x 1,938
Gross wing area (sq ft)	2,990	1,408
Span (ft)	130	113
$C_{L\ max.}$ normal	1.13	1.35
$C_{L\ max.}$ flapped	—	1.87
Aspect ratio	8.55	9.06
Wing loading (lb/sq ft)	9.54	58.2
Power loading (lb/h.p.)	12.95	10.6
Take-off :—		
Ground run (yd)	287	1,153
Total run to 50ft (yd)	460	1,380
Speed (m.p.h.)	57.5	110.8
Landing :—		
Landing weight (lb)	28,500	75,000
Total run from 50ft (yd)	—	1,200
Ground run (yd)	222	970
Speed (m.p.h.)	57.5	105.8

airfields, thus improving block speeds and increasing utilization. A comparison of modern transport types showed that take-off distances were considerably longer than landing distances, and the paper was therefore concerned with reduction of take-off runs, since the landing problem would automatically be simplified if reduced minimum speeds were achieved.

The Aerodynamic problem.—The lecturer then examined the aerodynamic aspects of the problem and the means by which wing lift could be increased, without an undue increase in drag, for shorter take-off runs. The effect of increased wing lift on performance could be illustrated by the example of the Hermes IV in which a progressive increase of $C_{L\ max}$ (up to 3.5) gave a substantial reduction in the total take-off run (Fig. 1). Beyond this value, however, further reduction was not worthwhile. Decreasing the all-up weight gave a greater reduction in take-off run for the lower values of $C_{L\ max}$ than for the higher ones. An increase in $C_{L\ max}$ gave a corresponding increase in drag, but not as a direct function of area, but of span^2.

It was therefore clear that, as the maximum lift coefficient was increased and minimum flying-speed reduced, the span must be increased to minimize the rise in induced drag. This could be achieved by increasing the aspect ratio in the same proportion. Quoting the example of the Hermes IV, the lecturer said that, by increasing the maximum C_L from 1.8 to 2.8, but keeping wing-loading unaltered, induced drag would remain unchanged only if the aspect ratio was increased from 9.06 to 14.2 (or the span from 113ft to 141.4ft). This would result in a structure of such a span that the increased weight would be prohibitive.

Weight and Aspect Ratio

He went on to show graphically (Fig. 2) how the estimated weight of Hermes wings of constant area rose with increase in aspect ratio, assuming that the wing-span/root-thickness ratio and the a.u.w. were kept constant. It was also apparent from these curves that the increase in wing weight for an aspect ratio raised from 9.06 to 14.2 was 860 lb, consequently, unless the a.u.w. could be raised by something considerably in excess of that figure, the change required to maintain induced drag constant for an increase in $C_{L\ max}$ was not worthwhile. The importance of aspect ratio and permissible a.u.w. on take-off became even more significant if the aircraft was operated in the tropics at high altitudes, particularly with turbojet power units. The problem, therefore, was to determine what type of lift-increasing device could be employed to give lift coefficients up to about 3.5 without undue increase in wing drag or weight.

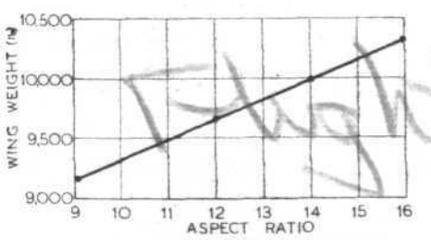


Fig. 2. Graph showing wing-weight as affected by increased aspect ratio.

There were four accepted methods of increasing lift: (i) by increasing the circulation around the wing by rotating a flap and thus increasing the camber; (ii) by increasing the wing area by a backward chord-wise movement of a trailing-edge flap; (iii) by preventing breakdown of the flow at the stall by means of slots, and extending the angular range of incidence for useful lift; (iv) by increasing the circulation over the wing by the application of forced boundary-layer control.

The lecturer compared the various types of split flap and H.P. slotted flap, together with the Zap and Fowler flaps, which move backward as well as rotate so as to increase wing chord, and therefore the effective area. The use of full-span flaps required some alternative to the normal aileron controls, and devices such as spoilers and ailerons in the flaps had not proved popular with pilots. It would appear, therefore, that some alternative method of achieving the desired ends must now be developed.

With trailing flaps alone actual $C_{L\ max}$ seldom exceeded 2.7. Full-span loading-edge slots gave higher values of $C_{L\ max}$ but required higher angles of incidence on landing. The case of flaps on a swept-back wing, as used on high-speed aircraft, presented a special problem particularly in sections with a sharp nose and a far-back maximum ordinate. Some comparative results obtained with flaps tested on a swept-back wing had shown that slotted flaps would delay the angle of stall more than would any other type, but they could not give a large increase in C_L. The pitching moment curve was unstable and suggested that the slotted flaps delayed the stall of the centre-section—an undesirable feature. The Junkers type of flap showed up well in all respects and, with trailing-edge flaps of 0.45 chord, gave a $C_{L\ max}$ of 1.95. This test was of academic interest only, however, because of the prohibitive dimensions which the flaps would need to assume.

Use of a nose flap had the effect of transferring the stagnation point from the critical sharp nose to the more stable rounded nose of the flap and, at the same time, reduced the pressure gradient that would otherwise exist behind the sharp leading edge of the aerofoil. Early separation at the nose of the aerofoil was thus avoided and higher values of $C_{L\ max}$ developed. The lecturer thought that as swept-back wings normally stalled first at the tips, the addition of these nose flaps outboard, or the orthodox leading-edge slots, should prove beneficial at the stall.

The problem of change of trim resulting from use of high lift devices could best be tackled by arranging first for a reasonable tail volume and then covering ground effects by detail design of the elevators. There should be a sufficiently large and unshielded portion of the elevators to give a necessary amount of tail-heavy pitching moment.

Boundary-layer Control.—Turning to the problem of boundary-layer control, the lecturer said that while trailing-edge lift devices did cause the entire pressure distribution over the wing to be stepped up, there was a limit to what could be done by natural means; he emphasized the need for some artificial means of increasing lift by energizing the airflow over the rear part of the wing; this was the basis of forced boundary-layer control.

Boundary-layer Rocketry

Wind-tunnel tests conducted by the R.A.E. in 1941 had given lift coefficients of up to seven on two-dimensional models and had shown that there was little difference in power required whether the air was sucked into or ejected from a wing. Whilst the power required depended on the desired increase in lift, the losses in the duct system increased considerably with larger spans and also with wing loading. It was for the two reasons of excessive power needed and weight involved in such a structure that progress in the application of boundary-layer control had been disappointingly slow. The Germans had been the first to indicate any possible solution to the practical problems, and on the Arado 232, a number of ground tests had been carried out with a rocket-operated feed-pump to move the air.

In applying this principle to an aircraft similar to the Hermes, the rocket would be used as a jet pump and directed as a multi-nozzle jet into a convergent mixing chamber. The fuel carried, which would be hydrogen peroxide with calcium or sodium permanganate as the reactor, would enable two take-offs and two landings to be made, with a total endurance of 45 seconds per operation. The jet-speed out of the reaction chamber would be of the order of 3,500 ft/sec, and the final temperature of the steam jet over the wing would be reduced to about 100 deg centigrade.

Although data for wings having different types of flaps subjected to boundary-layer control was limited, some general conclusions drawn from British tests showed that there was an economy (up to $C_{L\ max}$ 6.0) in the quantity of pressure air used as the flap chord was increased. German tests had shown that, where suction was used, the efficiency of the flap deteriorated when the chord was increased above about 25 per cent.

SPEED, SAFETY, ECONOMY . . .

The main conclusions drawn from experimental analysis were that power required to operate boundary-layer control for lift was proportional to wing loading in a ratio of 3 to 2, which made it somewhat costly for modern civil transports with wing loadings of from 60 to 80 lb/sq ft. Aspect ratio was an important factor affecting the power required, because it determined duct length and, to a large extent, duct losses. Thus, while the power required could be reduced if a small aspect ratio were used, a high aspect ratio must be employed if induced drag were to be kept low. Some compromise therefore seemed necessary in the design.

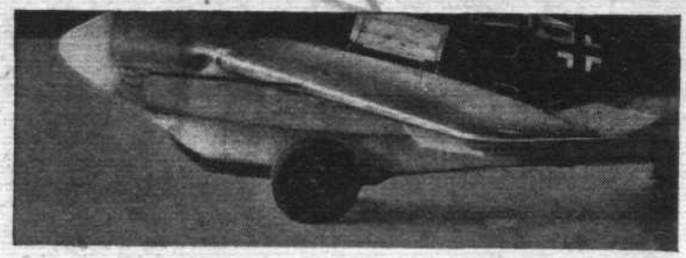
For aircraft similar to the Hermes IV, the horse-power required to ensure a developed $C_{L\ max}$ of 5.0 was just ten times that required for a $C_{L\ max}$ of 3.0, but as the gain in take-off was not greatly improved over C_L 3.5, there appeared to be every reason to limit the $C_{L\ max}$ to this figure, at which the horse-power needed (840) seemed reasonable and the weight of equipment and fuel required (3,550 lb) was manageable.

A comparison between the effects of boundary-layer control on take-off and direct thrust augmentation by rockets showed that, whereas boundary-layer control enabled a reduction to be made in the ground run, rockets would not lower the stalling speed of the aircraft at all, but merely reduced the distance from take-off to 50ft by increasing the available rate of climb. From this it was apparent that rockets would prove more beneficial during take-off if used to augment lift rather than thrust. They could not, of course, have an effect on the length of landing-run such as could be obtained with boundary-layer control.

Forced boundary-layer control seemed to offer the greatest promise for further development. Although the equipment and fuel would involve an addition to basic weight at take-off of some 5,200 lb for a $C_{L\ max}$ up to 4.0, it should be possible to increase operational take-off weight by at least 10,000 lb without exceeding a 900-yd distance to cross the 50ft barrier. In addition, the actual flap system used would be simpler than for high-lift devices and would also make for certain savings in weight.

Take-off and Landing Problem.—Sir Frederick's paper then dealt with the question of how far such improvements could reduce the size of, or even eliminate the need for, lengthy concrete runways. Undercarriages for present-day transports weighed from 4 to 6.5 per cent of the all-up weight; in the case of the Hermes the undercarriage weight amounted to almost 25 per cent of the actual payload. This was particularly significant for aircraft which were required to carry out a non-stop London-New York service, where the weight of landing gear might actually equal the payload as a percentage of all-up weight.

Some alternative to the undercarriage therefore seemed necessary but, in its use, certain desirable requirements had to be considered. In the first place take-offs and landings of normal aircraft should not be interfered with; it must be possible to clear landing areas quickly; taxying of the modified aircraft must be easy; and initial cost and subsequent upkeep would have to be considerably less than that of the normal runways. Also, the landing operation should be simple and reliable enough to retain passengers' confidence. Briefly reviewing existing circumstances in which aircraft operated without undercarriages, Sir Frederick cited the flying-boat, pointing out that it was probably true to attribute its present limited use to the world-wide establishment of land bases during World War II; he also referred to arrester-gear landings, which were clearly of specialized application.



The latter part of Sir Frederick Handley Page's paper dealt with the possibilities of the detachable wheeled-undercarriage and skid landing gear. The system was successfully used by the Germans on the Me 163 rocket-propelled intercepter.

A logical alternative to the undercarriage would be to mount the aircraft on a multi-wheeled bogie with tracks or low-pressure tyres that would permit operation from grass airfields. On take-off the bogie would be released, and for landing a skid undercarriage would be employed; it would be of such a height that the aircraft could be easily re-mounted on a similar bogie for subsequent manœuvring. The take-off bogie could be power driven to increase acceleration and reduce take-off run.

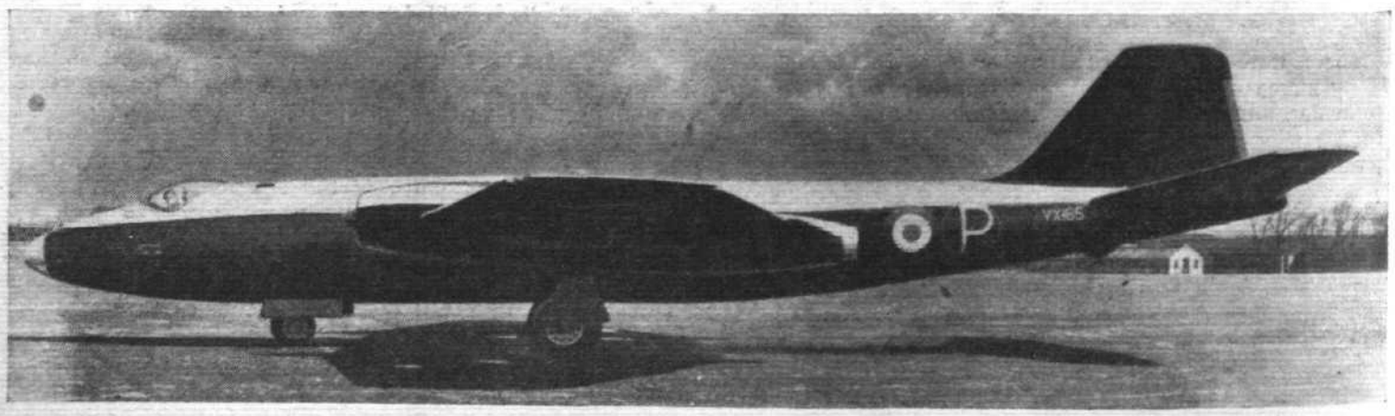
It had been estimated that elimination of the Hermes IV undercarriage would increase the rate of climb at take-off by 300ft/min, and there would be a great saving of weight, already referred to, to increase the payload. To land on skids would be but a development of the successful belly-landings which are now made in an emergency, while on jet-powered aircraft, the question of airscrew clearance would, of course, not arise. The braking effect given by such a landing gear would be superior to the present system and tyre wear associated with concrete runways would be eliminated. The attractions of skid-landing became particularly evident if advantage were taken of high-lift devices to reduce minimum flying speed.

So far little development work had been done in this type of design, but on longer services particularly, where payloads formed only a small percentage of the all-up weight, there was a promising case for the immediate development of the undercarriageless aircraft. Where concrete runways had to be used, however, a saving in airfield cost could be effected by fitting aircraft with tricycle and castoring undercarriages, in addition to high-lift devices, so that only a short, uni-directional runway need be provided.

In conclusion it could be said that the employment of rocket devices to provide forced boundary-layer control appeared to be one of the most promising means which the designer had at his disposal for the material reduction of minimum flying speeds. Among the advantages which could be derived from high-lift devices were the facts that aircraft need not be increased in size and that cruising speed and payload were not adversely affected. There were also the secondary advantages of greater safety in take-off and landing, and the possibility of extending air transport to undeveloped and under-populated regions.

Finally, Sir Frederick Handley Page recommended for serious study the adoption of the more simplified arrangements of landing gear which would become rational when minimum flying speeds had been reduced to about 70 m.p.h.

NOW IN PRODUCTION FOR BOMBER COMMAND : THE CANBERRA B.2



The first production version of the English Electric Canberra jet bomber is designated Canberra B.2. Powered with two Rolls-Royce Avon axial-flow turbojets, it differs little from the B.1 prototypes, except in equipment and in having a transparent nose.

For the attention of air-line operators

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demonstrates its unrivalled capabilities
on two typical main-line stages

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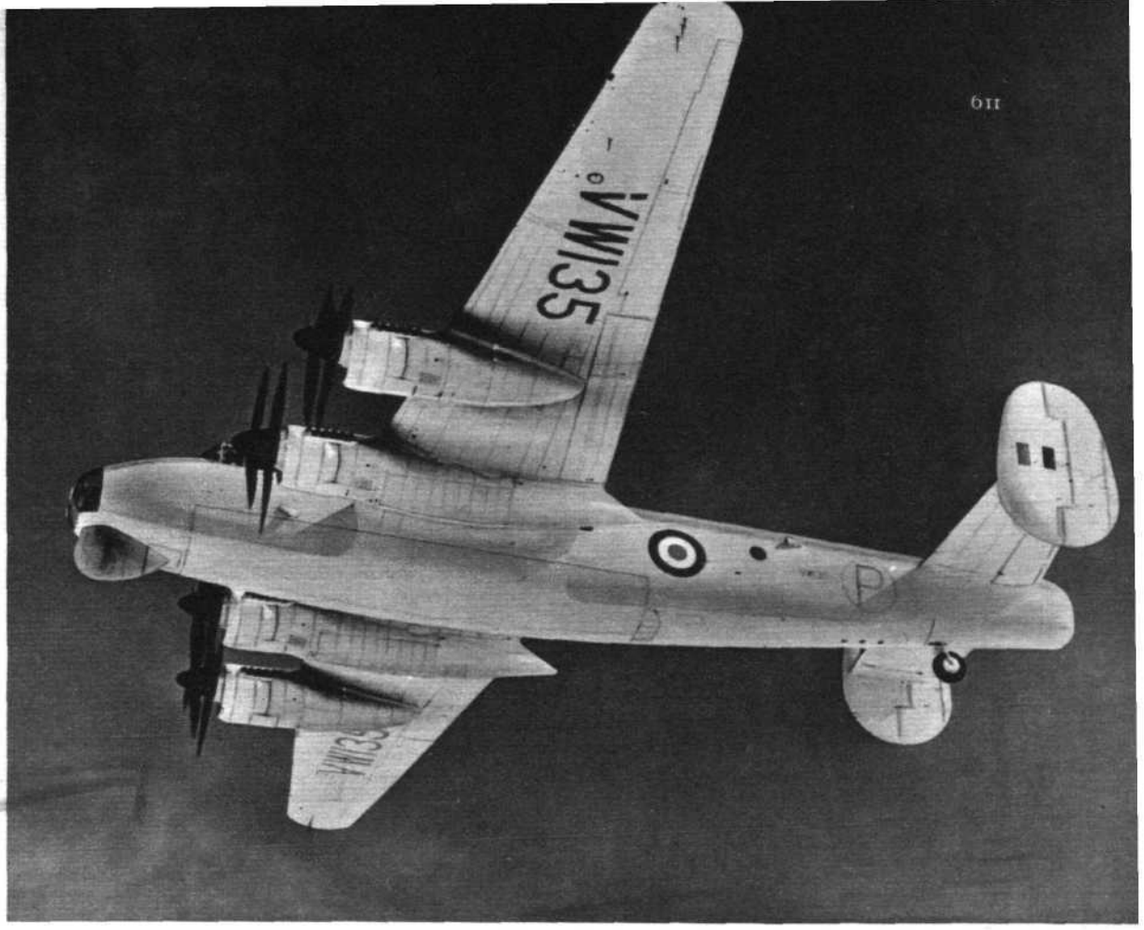


Though not the most elegant of Service aircraft, the Shackleton is nothing if not business-like in appearance and, as this *Flight* photograph will confirm, has a certain rugged grandeur.

SHACKLETON

The New Avro General Reconnaissance Aircraft for Coastal Command : A Key Type In Our Anti-Submarine Force : Crew Comfort : Rolls-Royce Griffon Engines

Sir Ernest Shackleton, 1874—1922.

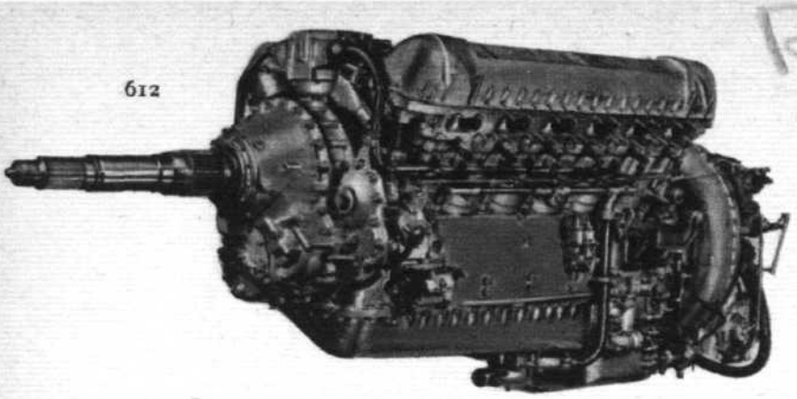
TO anyone perturbed by the state of Home and Commonwealth defences one of the most significant and reassuring events in the aeronautical calendar will be the delivery, now imminent, of the first Avro Shackletons to R.A.F. Coastal Command. The functions and characteristics of the Shackleton, and considerations underlying its design, have been widely misunderstood (even, on occasions, blatantly misrepresented), and it seems desirable to preface our description with some general observations on background and functions.

First, it is necessary to take stock of the equipment which the Shackleton is intended to replace. Two types of aircraft—the Sunderland flying boat and the Lancaster landplane—are primarily concerned, types which, by virtue of their legendary qualities of dependability and tractability, have achieved an unsurpassed reputation. But modern warfare brooks no sentiment. Operational efficiency is the uncompromising demand, and those who fly the Coastal Sunderlands and Lancasters are only too well aware that replacements are already overdue. The threat of the schnorkel-equipped submarine mounts daily, and while America has wisely apportioned large sums (which she alone could afford) to the re-arming of her anti-submarine squadrons, we ourselves have been frustrated in implementing our plans in this direction. Now, at last, a blurred and gloomy picture begins to clear. Not only are the first Shackletons about to be delivered to the Service, but orders for a new type of carrier-borne machine, likewise designed to hunt and destroy the deep-breathing submarine, are considered imminent. Up to the present, however, no type of flying boat to succeed the Sunderland has been announced. That this class of aircraft should be totally abandoned is as improbable as it would be unfortunate; nevertheless, it is evident that in the period immediately ahead the shore-based anti-submarine squadrons of Coastal Command will be armed principally with the Shackleton.

In deliberating on the special qualities demanded of a long-range, land-based, anti-submarine aircraft, and in assessing the Shackleton in this respect, we are stringently governed by considerations of security: nevertheless, such an appraisal is worth-while.

Among operational requirements, range at medium and low altitudes is cardinal, and though no figures may be adduced for the Shackleton, it may be remarked that the crews of Coastal Lancasters already take sorties of 12 and 14 hours in their stride. The roominess of the Shackleton, and the attention paid to crew comfort, are indicative of the protracted flights intended.

As there is no purpose in flying over great areas of sea if the means of locating a target are deficient, provision must be made for the very newest and most elaborate radar equipment, and (a most important consideration) for the



Rolls-Royce Griffon engine, with provision for de Havilland contra-rotating airscrew. Four of these units power the Shackleton G.R.1.

SHACKLETON . . .

personnel and facilities to ensure the manning of this gear to the best advantage. The massive A.S.V. scanner, jutting like Neptune's beard from the fore part of the fuselage, is, indeed, a "functional" characteristic, and a crew of ten ensures that the operators of this and other special installations shall not be fatigued to the point of inefficiency by their long watches above the ocean.

The target having been detected, it must be summarily dealt with, postulating adequate closing speed and good manœuvrability at low altitudes, and heavy offensive armament. As for speed and manœuvrability, the demonstrations of the Shackleton at public functions (notably the S.B.A.C. Display last year) may be cited. On this last occasion the massive machine was brought past the crowd at head-level. Two of the four Rolls-Royce Griffon engines were seen to be stopped, and the vast bomb bay yawned. Even allowing for the speed of the preceding dive, a marked degree of liveliness and an ample reserve of power were apparent—as (especially to those spectators familiar with the Lancaster and Lincoln) was the capacity of the bomb bay.

Of the offensive load itself it may be remarked that the weapons and devices used by Coastal Command are generally bulky (due to the quantities demanded) rather than heavy. They include bombs, depth charges, sono-buoys and—it may be supposed—the new air-launched homing torpedoes to which the Parliamentary Secretary to the Admiralty referred in the House of Commons on March 22nd. Only for attacking the heaviest surface vessels and shore emplacements would a Coastal aircraft be likely to carry the heavier types of bomb, but the knowledge that a 12,000-pounder is easily within the normal capacity of the Lancaster and Lincoln is reassuring.

In the design and development of such a large and elaborately equipped aircraft as the Shackleton the closest collaboration between the user Service and the manufacturer is imperative. That this has been forthcoming is evident on entering the Shackleton and is borne out by the sectioned drawing on pages 614 and 615. The continuous reviewing of tactical requirements, moreover, is illustrated by the deletion of the nose armament of two barbette-mounted 20 mm guns, and of the rear turret (2 × 0.5in) which characterized the first prototype. On the second and third prototypes and on initial production aircraft only the dorsal (2 × 20 mm) turret is retained.

A most valuable exchange of views on operational requirements took place when Mr. J. D. Baker lived and flew with a Lancaster squadron of Coastal Command during the Fleet exercises last March. Mr. Baker is one of the Avro test pilots who, under Mr. J. H. Orrell, have been responsible for Shackleton development flying. Numerous points of criticism then voiced by Lancaster aircrews are being met in the Shackleton. Though Mr. Baker's report is not available for reproduction, it may be supposed that, like members of *Flight's* staff who have endured 14-hr Lancaster sorties, he will have remarked on the restricted crew space, absence of bunks and cooking facilities, high noise level, inadequate heating and ventilation, and lack of a blind-flying panel for the second pilot. These are hereditary deficiencies which could not readily be rectified in adapting the Lancaster for Coastal Command use, and though speculation would be premature, it is felt that operational crews will be well pleased with the general level of comfort and convenience in the Shackleton. Much of the fatigue to which they have hitherto been subjected can be ascribed to noise, so the generous provision of sound-proofing quilts will be especially welcomed. With the present exhaust-manifold arrangements, however, the noise level in the pilots' cockpit (this being in the plane of the four Griffon-driven, contra-rotating airscrews) must be high. A substantial reduction might be effected if thicker Perspex were used for the side windows, and if Rolls-Royce cross-over exhaust manifolds, as developed for the Merlin engines of the B.O.A.C. Canadair Fours, were fitted to the Griffons.

An outline history of the Shackleton's development to date may be given at this stage. Towards the end of 1945 interest was expressed by the Air Staff in conversion of the Lincoln bomber for general reconnaissance and air/sea rescue duties. A design study showed a wider and deeper fuselage to be necessary, not only for the stowage of the radar and other equipment demanded for the new duties, but to allow the freedom of movement and amenities considered by the late Mr. Roy Chadwick, then technical director, to be imperative. The specification was issued in April, 1946, and by May of the following year the mock-up conferences had been concluded. The first flight was made by Mr. Orrell at Woodford on March 9th, 1949, and was witnessed by Mr. W. S. Farren (technical director); Mr. S. D. Davies (chief designer); Mr. W. M. Taylor (the project designer concerned); and Mr. J. Rimmington (project engineer). Although the design of the Shackleton was initially undertaken by Mr. Chadwick, the work was completed by Mr. Taylor.

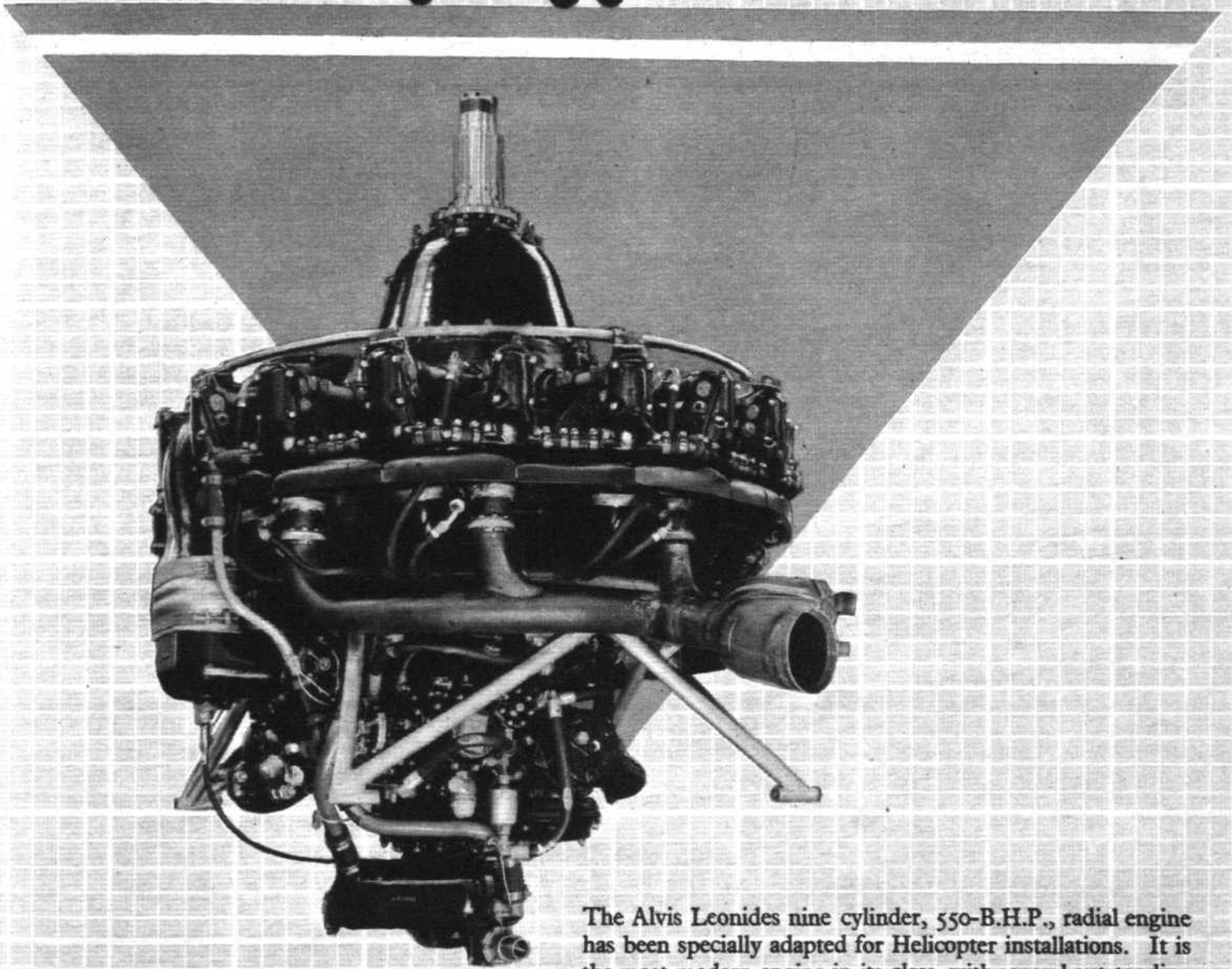
It may not be generally known that the Shackleton's appellation accords with an Air Ministry policy of naming all new general reconnaissance landplanes after explorers and all flying boats for similar duties after coastal towns.

The Shackleton (Avro 696) is Britain's largest Service aircraft. To a marked extent tooling and design costs have been defrayed, and delivery expedited, by utilizing components of the Lincoln and Tudor, either in their original, or somewhat modified form. Wings, tailplane and undercarriage are basically those of the Lincoln, but the increased all-up weight and the higher aerodynamic drag of the new, high-capacity, fuselage necessitated the adoption of Rolls-

Key features of the Shackleton, notably the vast bomb-bay doors, are visible in this imposing ground study of the second prototype.

ALVIS LEONIDES

the Power Plant of the Westland-Sikorsky S.51 Helicopter



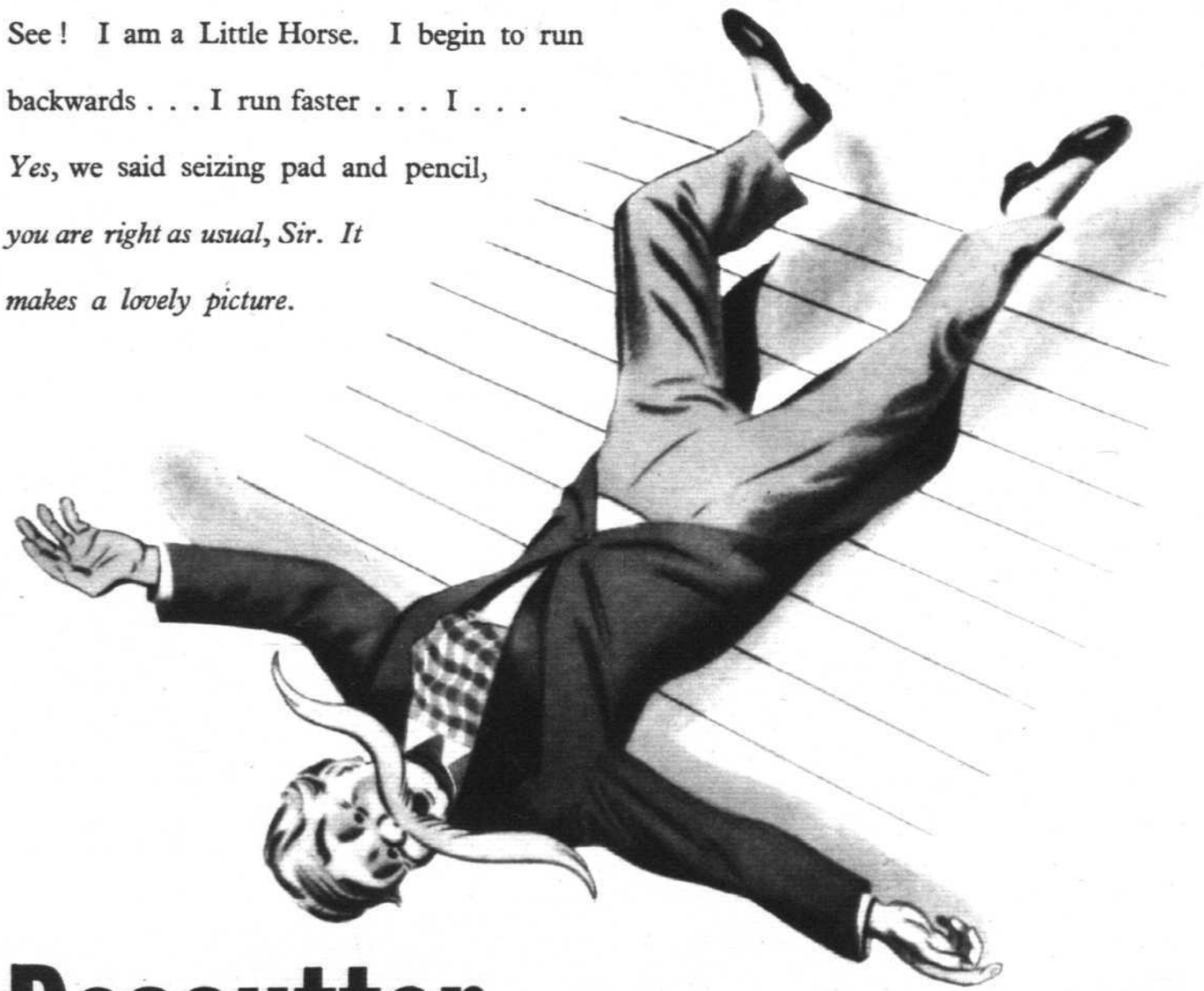
The Alvis Leonides nine cylinder, 550-B.H.P., radial engine has been specially adapted for Helicopter installations. It is the most modern engine in its class, with several outstanding features, including totally enclosed pressure-lubricated valve-operating mechanism—giving quietness and cleanliness—an anti-icing fuel injection system and automatic mixture and boost controls—for control simplicity—and a special cowling arrangement, with pressure baffles and fan—to provide adequate cooling in all operating conditions

ALVIS

ALVIS LIMITED · COVENTRY · ENGLAND

Do you reverse?

I want an advertisement—said the Managing Director—to publicise the reversing switch which is fitted to our new electric screwguns and nutrunners. Our Little Horses must be shown running backwards at great speed. *Can't be done*, we said, *they will look as though they were falling over*. Can't ! Can't !—said the M.D. agitating his moustaches in a threatening manner—What strange word is this ? Of course it can be done. See ! I am a Little Horse. I begin to run backwards . . . I run faster . . . I . . . *Yes*, we said seizing pad and pencil, *you are right as usual, Sir. It makes a lovely picture.*



Desoutter

POWER TOOLS INCREASE PRODUCTION

DESOUTTER BROS. LTD., THE HYDE, HENDON, LONDON, N.W.9. TELEPHONE: COLINDALE 6346-7-8-9. TELEGRAMS: DESPNUCO, HYDE, LONDON.

CRC213

The cockpit, framed by radio and flight-engineer's stations.

SHACKLETON . . .

Royce Griffon engines instead of the less powerful Merlins.

Although larger than that of the Lincoln, the Shackleton's fuselage is generally similar in construction. It is of ovoid section and of light-alloy stressed-skin construction throughout. There are five sections (nose, front centre-section, intermediate centre-section, rear centre-section and rear section), and four transport joints, the nose and front centre-section being transported as one unit.

The structure has flanged channel-section formers throughout, excepting those at the fuselage joints and at other positions where reinforcement is necessary, and where specially strong formers are employed. All formers, other than those at the joints, are cut away on the outer edges to take angle-section stringers, attached by riveted brackets. Two main longerons, of extruded channel-section, carry the cross-members for the main floor and bomb beams; their lower edges are used for attaching the bomb doors.

The fuselage nose section is cut away to form a parachute exit and an opening for the A.S.V. scanner, the latter being covered by a Perspex cupola. The bomb aimer's window conforms to the outline of the nose and is divided into a front, two side, and three top panels.

In the top of the front centre-section is a cut-out for the cockpit, the enclosure of which departs from Lancaster and Lincoln practice in being flush with the fuselage top-line. The windscreen has a die-cast light-alloy frame, and the upper side-frames embody direct-vision windows. To obviate misting there are dry-air sandwich-type panels in the centre panes. Aft of the windscreen the enclosure has a tubular framework with Perspex glazing, except for the two aft top panels, which are metal-skinned. The enclosure incorporates two escape hatches, one at each side of the roof, and on each side of the fuselage there is a ditching exit, opening on to the upper surface of the wing. Another escape hatch is located in the top of the fuselage rear centre-section. The main entrance door is on the starboard side of the rear section. Access is gained by means of a ladder, attached, when required, to the bottom of the door frame and stowed at other times in the roof of the fuselage.

The bomb doors are built up on a central prefabricated spar, the web of which has riveted, extruded-angle-section flanges on both faces, forming an I-section fore-and-aft profile. At each end there are double ribs, braced by stiffeners of pressed channel section, with lightening holes. Between the stiffeners is a swivel pin, carried in ball-bearing housings and connecting with the fork end of the operating-jack piston rod. The intermediate, two-piece, ribs are of pressed sheet, flanged all round, and riveted to the web of the main spar and to the spars which form the door edges. The upper spar is of extruded channel section and serves as the hinge beam. It has a lip on its outer top face which remains close to the sealing strip on the fuselage longerons when the bomb doors are closed. For the lower edge of each door a pressed channel section is used and, on the port door only, there is rubber beading for sealing. Detachable inserts in each door allow a Mk. 3 airborne lifeboat to be carried for air-sea rescue duties.

The wing comprises five main sections: centre wing (integral with the fuselage intermediate centre-section); port and starboard intermediate sections; and port and starboard outer sections. Only the intermediate and outer sections have dihedral. The light-alloy spar booms vary in section and are machined from rectangular-section extruded bar. Each spar web is made up of eight sections, the edges of which are butted together and linked by riveted joint plates. The undercarriage beams are secured to the forward face of the front spar by two bolts passing through the web, booms and attachment forks for the forward end of each engine rib. Aileron hinges are formed by lugs bolted to the rear face of the spar.

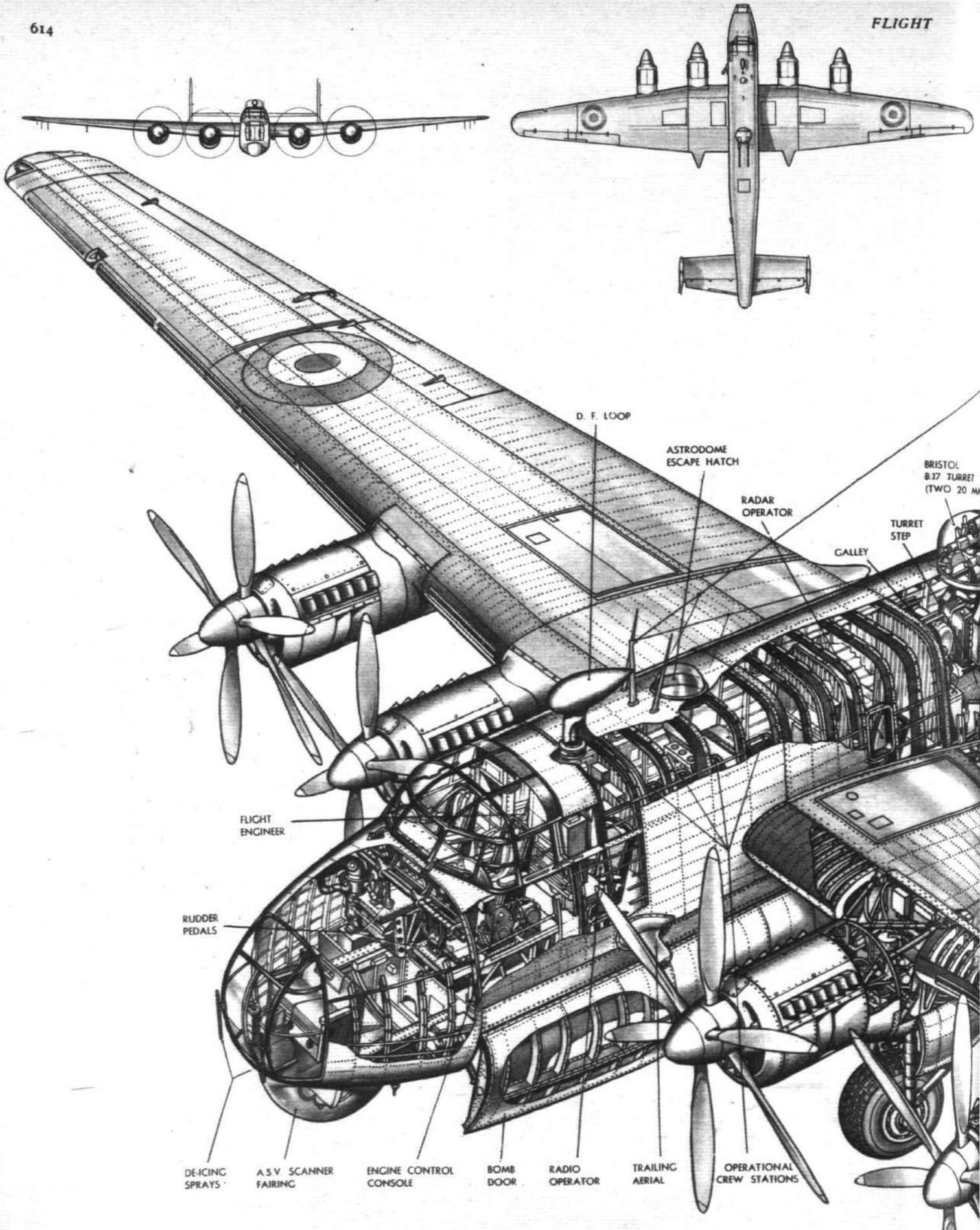
The ailerons themselves are of light-alloy construction throughout, built round a spar of pressed sheet, with top and bottom flanges. Mass-balance weights are bolted alongside the leading edge, and balance discs may be fitted over bolts to establish static balance. Each inner aileron section carries a trim-tab, attached by a piano-type hinge and having an operating-arm assembly riveted to the under surface. At the inboard end of each outer aileron section is a balance tab, automatically operated by adjustable connecting rods.

The split trailing-edge flaps are in three sections on each side—inboard (extending from the fuselage to the aft fairing of each inboard nacelle); outboard; and flap extension. Operation is by push-pull tubes, working in conjunction with actuating rods to give a universal-joint action.

The two-spar tailplane carries a fin-and-rudder assembly at each extremity and is constructed in two halves, bolted together inside the fuselage, and attached by bolts. Each half of the elevator has a trimming tab and a balance tab, and each rudder has its own trim-tab.

A tailwheel undercarriage was retained to secure maximum utilization of the space available in the nose for observation panels and service equipment, and also to obviate encroachment on the bomb-stowage space. The undercarriage comprises two rearward-retracting main-wheel units, one under each inboard engine nacelle, and a fully-

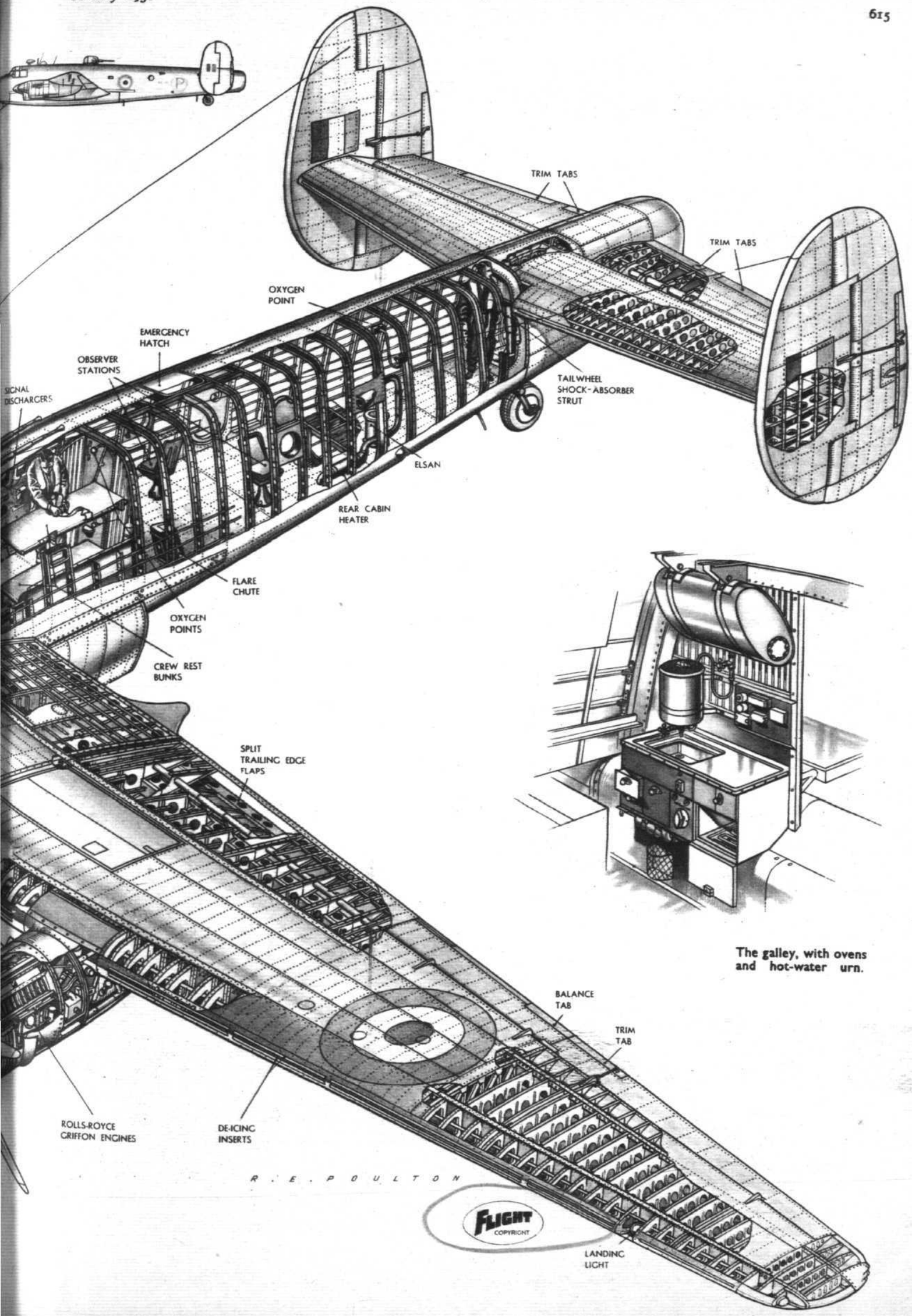
While Shackletons take shape in the foreground, Lancasters for Coastal Command are undergoing reconditioning behind them.



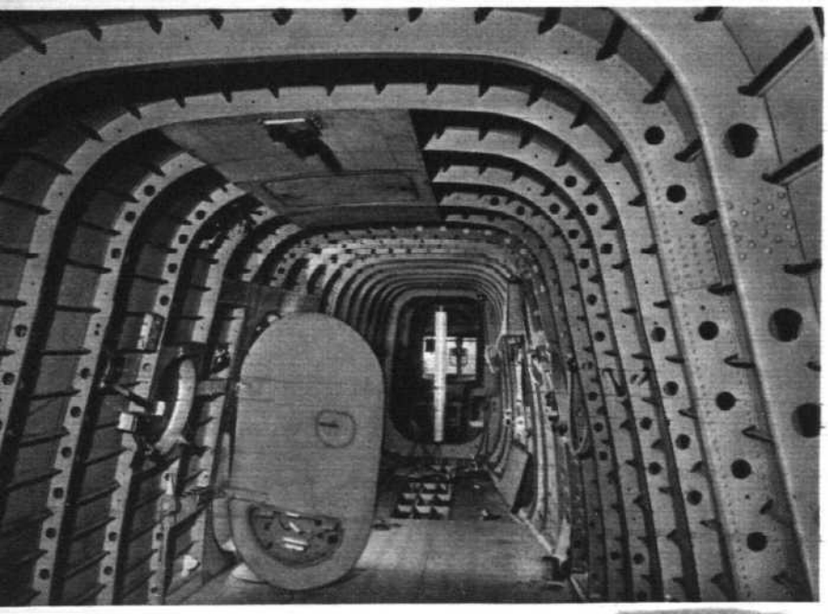
AVRO SHACKLETON G.R.1

Four Rolls-Royce Griffon engines with two-speed, single-stage superchargers and fuel injection pumps. Four 13-ft de Havilland Hydromatic six-blade contra-rotating airscrews.

Span	120ft	Gross wing area	1,421 sq ft
Length	77ft 4.25in	Area of ailerons (including tabs)	113.4 sq ft
Height (tail up)	21ft 10in	Area of flaps	187.3 sq ft
Height (tail down)	16ft 10in	Mainplane incidence	4 deg
Track	23ft 9in		



The galley, with ovens and hot-water urn.



"Flight" photograph.

Illustrative of the robust structure and roomy interior (looking aft).

SHACKLETON . . .

castering, non-retractable, tailwheel unit. Each main-wheel assembly is a pin-jointed assembly of two Dowty oleo-pneumatic shock-absorber struts, connected at their lower ends by the wheel axle and at the upper ends by a cross strut and "K" bracing. Lugs on the forged upper-end fittings are bolted into the forked ends of the undercarriage beams. At the rear of the shock-absorber struts are forged lugs, attached to the forked ends of the radius-rods. These rods are knuckle-jointed near their centres, the joints incorporating "up" and "down" locks, operated by rods connected to the jack piston-rod ends. Each axle carries a Dunlop wheel and twin-brake unit.

A longitudinal mounting beam in the rear-fuselage section provides the main support for the tailwheel unit, which carries a Dunlop wheel, a self-centring Dowty oleo-pneumatic strut, and a fluid dashpot to prevent shimmy.

The dual main flying controls comprise pendulum-type rudder pedals and hand-wheel control columns. Tubular push-pull control rods are used, except for the aileron controls in the fuselage, which are made up of chains, tie-rods and cables. The trim tabs are cable-operated from duplicated cockpit hand-wheels.

The engines are four Rolls-Royce Griffons, the mark of which may not at present be stated, but which deliver almost 10,000 h.p. for take-off. They are pressure-liquid-cooled and have two-speed, single-stage, superchargers and fuel injection pumps. The airscrews are of de Havilland Hydromatic contra-rotating, constant-speed, six-blade, feathering type, and measure 13ft in diameter.

Cowlings are of circular-section, as now generally adopted for Rolls-Royce engines. The tubular engine bearers, built out from the main wing spar, are more massive than those normal in Griffon-engined single-seat fighters, and, in conjunction with resilient mountings, are effective in reducing vibration.

Each engine has an independent oil system, which feeds the appropriate airscrew-feathering pump. The inboard oil tanks are mounted in the spaces between the centre-section and the intermediate sections of the mainplane, and the outboard tanks are supported from the nacelle sub-frames. For cold-weather starting an oil-dilution system is provided.

Coolant and oil radiators are housed in ducts in the forward lower portions of the cowlings and operate in conjunction with controllable shutters.

The accessory systems derive power from an engine-driven auxiliary gear box mounted behind the firewall in each nacelle. The outboard gear boxes have four drive-faces, and the inboard boxes six, though all faces are not normally utilized. Each box carries a 24-volt, 6-kW, D.C. generator for power supply to the main electrical system, and a small A.C. generator to operate the engine-speed indicators. Additionally, No. 4 gear box has a high-pressure hydraulic pump to provide power for the main-wheel units, flaps, bomb doors, fuel jettisoning and windscreen wipers. No. 3 gear box has a high-pressure Hymatic air compressor to operate the wheel brakes, a second hydraulic pump (interconnected with that on No. 4 gear box), and a Pesco vacuum pump for the gyroscopic blind-flying instruments. No. 2 gear box has a second air compressor (operating a duplicate brake system and several engine services), and a second Pesco vacuum pump which, in emergency, can operate the blind-flying instruments, though it normally serves the bomb sight. There are no accessories on No. 1 gear box other than the generators mentioned.

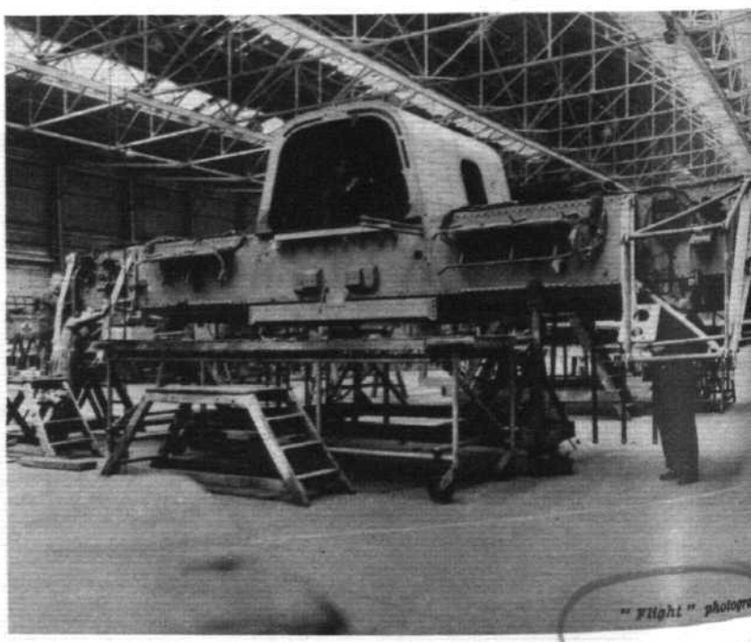
The four generators feed a 24-volt D.C. electrical installation and are connected in parallel to charge 12-volt accumulators, interconnected to give a 24-volt, 80-amp/hr supply for all general electrical services, and for the motor generators and rotary converters of the radio and radar. The main power and distribution panel is on the starboard side of the fuselage, forward of the front spar. Electrical control is employed for three pneumatically actuated engine controls—hot and cold air intake, radiator flaps, air cleaners, and, in addition, for bomb release, fuel cock controls and other ancillary equipment.

There are T.K.S. de-icing systems for mainplane and tailplane leading edges, fins, airscrews, and windows in the cockpit and air bomber's station. De-icing fluid is mechanically pumped to porous-metal distributors in the leading edges, and a second pump supplies the airscrew de-icing shoes. The windows receive the fluid from a spray, fed by outside distributors connected to a pressurized tank in the nose.

Each engine nacelle has two automatic fire-extinguishers actuated by the airscrew-feathering buttons and incorporating fire-warning lamps connected to flame switches. Inertia switches, linking directly with the extinguishers, are also installed. All tank bays in the mainplane are fitted with spray tubes connected to twelve automatic extinguishers. These are actuated by flame switches, connected in turn to ignition cords round each tank. The system may alternatively be operated by the pilot or by an inertia switch in the fuselage nose.

Description of the Shackleton's military equipment is possible only within prescribed limits. As already noted, the normal operational crew will consist of ten men. All have back-type parachutes, except the air gunner, who

The centre wing, integral with fuselage intermediate centre-section.



"Flight" photogr

mans the Bristol B.17 turret with its twin 20-mm Hispano guns, and whose parachute is stowed on the starboard side of the fuselage, aft of the heavily armoured turret. The parachute exit is in the floor of the fuselage nose and, as already noted, there are several escape hatches. Two Q-type dinghies, each capable of carrying seven persons, are part of the normal equipment and are stowed in the centre-section of the wing; they are automatically released and inflated by means of a handle in the fuselage. Additionally, there are ten individual dinghies, although stowages are provided at twelve points to allow for movements of the crew. As in all new British Service aircraft, crew safety was a prominent consideration in drawing up the specification. Thus, a detachable compartment in the main door contains an axe and asbestos gloves. There is a second axe above the window at the navigator's station, and every crew station is provided with a hand fire extinguisher and portable oxygen bottle. First-aid kits are stowed in the centre-section and rear fuselage.

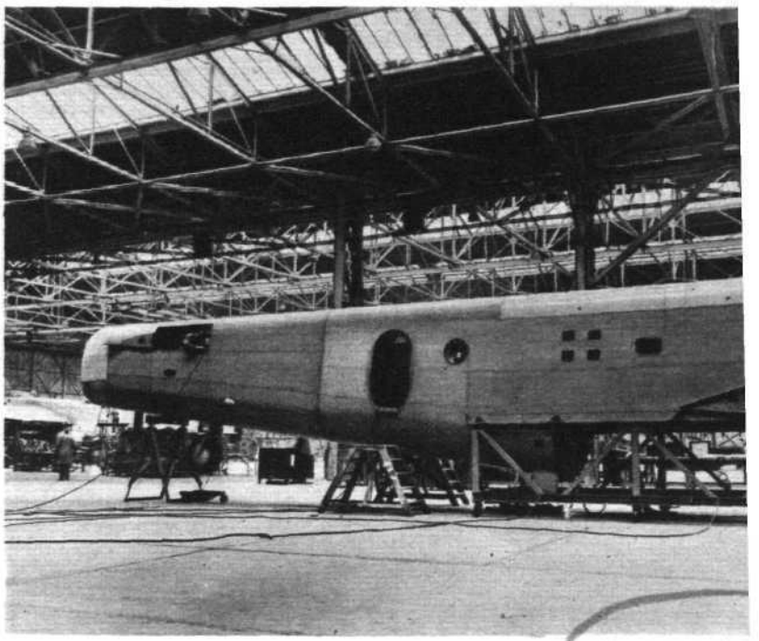
All permissible information on crew positions, location of the galley and other internal features is embodied in our sectioned drawing. As already intimated, close attention has been paid to soundproofing, and quilts made up from an outer covering of black Vynide, Fibreglass and a back covering of glass-filament cloth extend over a large area of the interior. The cabin is heated by three Janitrol or Daniel combustion heaters, fed from one of the main fuel-distributor tanks.

A vertically mounted signal pistol fires through the roof above the flight engineer's position, and batteries of signal dischargers are located in the rear fuselage forward of the observation station on the starboard side. An Aldis signalling lamp may be plugged into the electrical supply at any one of a number of points. The pilots' panel is illuminated by red and ultra-violet lamps, and emergency illumination is supplied from a small independent accumulator.

In addition to the radar and long-range navigational equipment, the Shackleton carries the following radio: general-purpose transmitter/receiver, radio compass, radio altimeter, and one or two V.H.F. transmitter/receivers. Intercommunication is afforded at all stations by a separate amplifier coupled to the V.H.F. receivers.

As might be expected, the Shackleton has comprehensive photographic equipment, installed in a special camera bay and including one Williamson F.24 camera for medium-level vertical photography, or one K.19B for medium-level vertical night photography, and one K.24 camera for low-level oblique photography. This last is mounted in a retractable housing.

Suppliers who have made some contribution to the construction, equipment and finishing of the Shackleton are listed in the next column. H. F. K.

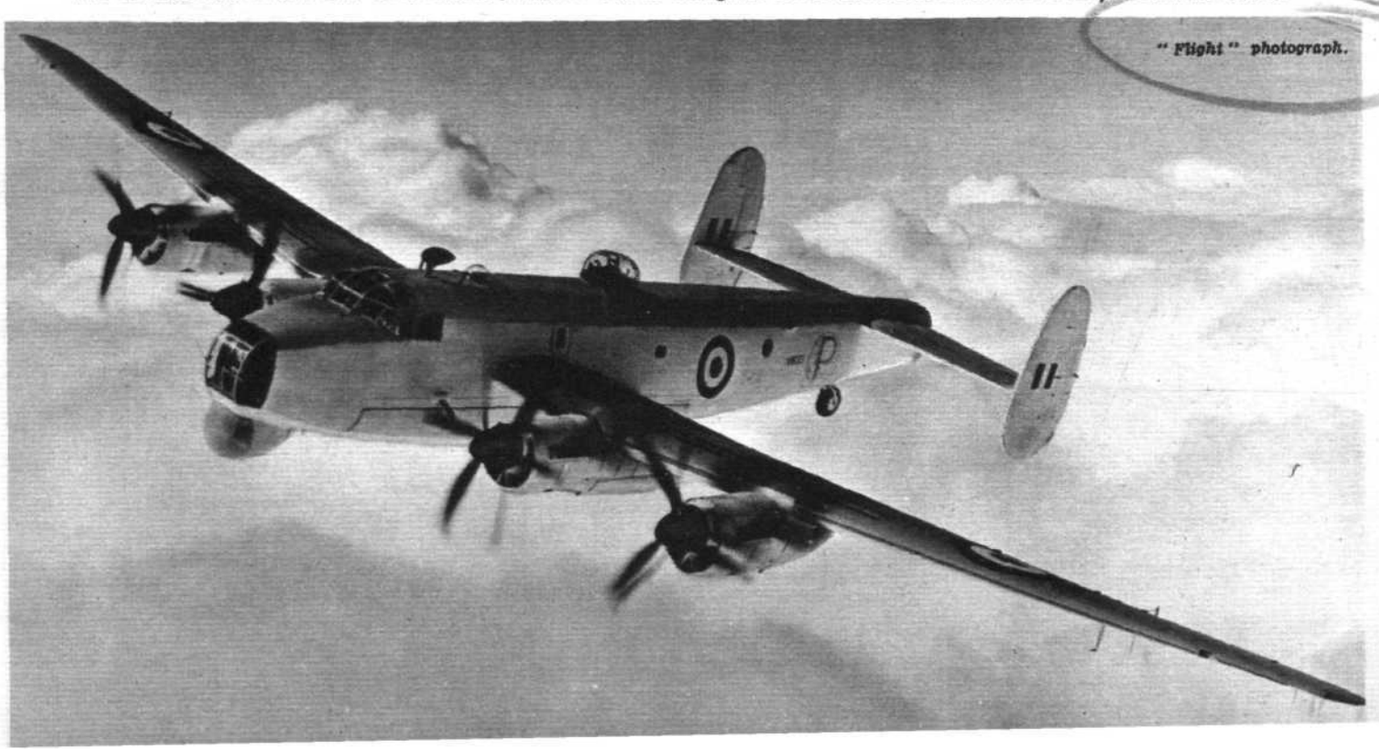


"Flight" phot

Together, the rear fuselage sections of the Shackleton form a massive structure. (Note proportions of the man at work in the tail).

Accles and Pollock, Ltd.; Amal, Ltd.; Automotive Products, Ltd.; Aviation Developments, Ltd.; B.B. Chemical Co., Ltd.; Birmetals, Ltd.; J. Booth and Co., Ltd.; Thomas Bolton and Sons, Ltd.; Brett's Stamping Co., Ltd.; Britannia Tube Co., Ltd.; British Aluminium Co., Ltd.; Brown Bayley's Steel Works, Ltd.; Brown Brothers (Aircraft), Ltd.; Connolly Bros. (Curriers), Ltd.; Cork Manufacturing Co., Ltd.; John Dale, Ltd.; The Deritend Stamping Co., Ltd.; Dowty Equipment, Ltd.; Dunlop Rubber Co., Ltd.; Dzus Fastener (Europe), Ltd.; English Steel Corporation, Ltd.; Fibreglass, Ltd.; Fireproof Tanks, Ltd.; Firth-Brown Tools, Ltd.; Firth-Vickers Stainless Steels, Ltd.; Fothergill and Harvey, Ltd.; Samuel Fox and Co., Ltd.; Sir George Godfrey and Partners, Ltd.; Graviner Manufacturing Co., Ltd.; Habershon and Sons, Ltd.; High Duty Alloys, Ltd.; Hughes-Johnson Stampings, Ltd.; The Hymatic Engineering Co., Ltd.; Imperial Chemical Industries, Ltd.; Integral, Ltd.; Jenks Bros., Ltd.; William Jessop and Sons, Ltd.; King Aircraft Corporation; J. H. Lavender and Co., Ltd.; Marston Excelsior, Ltd.; Normalair, Ltd.; Northern Aluminium Co., Ltd.; The Palmer Tyre, Ltd.; H. Perks Co., Ltd.; Perry Barr Metal Co., Ltd.; Ransome and Marles Bearing Co., Ltd.; Reynolds Tube Co., Ltd.; Rotax, Ltd.; Rubery, Owen and Co., Ltd.; Sangamo Weston, Ltd.; Saunders Valve Co., Ltd.; Self-Priming Pump and Engineering Co., Ltd.; Siebe, Gorman and Co., Ltd.; The Skefko Ball Bearing Co., Ltd.; Smiths Aircraft Instruments, Ltd.; Sperry Gyroscope Co., Ltd.; Sterling Metals, Ltd.; T.I. Aluminium, Ltd.; T.K.S. (Aircraft De-icing), Ltd.; Teddington Controls, Ltd.; Teleflex Products, Ltd.; Titanine, Ltd.; Tungum Sales Co., Ltd.; Henry Wiggin and Co., Ltd.; Yorkshire Copper Works, Ltd.

The Shackleton's Bristol B.17 dorsal turret, with its two 20 mm guns, is shown here to command a very wide field of fire.



"Flight" photograph.

VISCOUNT ON THE CONTINENT

LOOKING as resplendent as it did before departure and not even a little travel-worn, the Vickers Viscount returned to Northolt on April 28th from its extended demonstration tour of western Europe. On the first part of the tour, which began on March 20th, the aircraft, piloted by Captain Wakelin of B.E.A. (the world's second turboprop-licensed pilot) had visited Amsterdam, Brussels, Zurich, Rome and Paris. Among the passengers were Sir Hew Kilner (aviation managing director of Vickers-Armstrongs) and Captain "Mutt" Summers, chief test pilot.

The Viscount returned to Northolt for the Easter holiday, and then took off again for visits to four capitals —Copenhagen, Stockholm, Oslo and (again) Amsterdam. During both stages of the trip, the total time spent in the air was 61 hours, involving some 70 flights and an overall distance, in transit, of 4,400 statute miles. The company subsequently announced that the total amount of kerosene lifted for the four Rolls-Royce Darts was 17,423 gallons, and that the remarkably low oil consumption of only 7.9 gallons was recorded. The average in transit fuel consumption, excluding demonstration flights, was in the region of 215 gal/hr.

On some of the point-to-point trips the Viscount was flown at 24,000ft and the pilot tried out certain new techniques; for example, a two-engine descent from altitude in order to conserve fuel was found to be quite practicable. At two destinations, the aircraft had to stand off because of bad weather and, again, seemed very happy when doing so on only two engines.

The manufacturers have subsequently expressed extreme satisfaction at the high degree of serviceability and the negligible amount of daily maintenance required. The only replacements needed throughout the trip, it is stated, was one compass amplifier and one torch igniter. It was also necessary to refill an oleo leg.

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It is understood that next month tropical trials will be carried out at Khartoum, and it will not then be very long before B.E.A. takes delivery of its first production machine. This will be the Viscount 700 with longer fuselage and slightly increased span, which will have to undergo a shortened version of the normal flight-test schedule before receiving its C. of A.

(1) The Viscount lands after a demonstration at Zurich-Kloten.

(2) Talking it over : officials, journalists and others at Stockholm.

(3) B.P. Aviation tankers supply kerosene at Amsterdam-Schiphol.

(4) Looking into it ; The British Ambassador in Stockholm, Sir Harold Farquhar, is interested in one of the Darts. Behind him are W./C. Wyatt, Air Attaché (partly obscured) and Mr. N. S. Roberts (Commercial Counsellor).

(5) With her white upper surface, and finished in silver-grey below the waist-line, the Viscount makes a graceful picture on the tarmac at Kloten, the airport of Zurich.

(6) Taxying on two : the aircraft at Bromma Airport, Stockholm.

(7) Lunch-table chat at Copenhagen. Left to right : Mr. Emil Damm of D.D.L. ; Capt. Summers ; Col. York, U.S. Air Attaché ; Sir Hew Kilner ; Mr. Harttung, Danish Rolls-Royce representative ; Capt. Wakelin ; and W/C. Bray, British Air Attaché, Copenhagen.

(8) Tailpiece : Herr Groh and Herr von Meiss, Swissair directors, go aboard for a demonstration flight at Zurich.

(9) Home again : Mr. R. C. Handasyde, Vickers Aviation sales manager ; Mrs. Summers ; Sir Hew and Lady Kilner, Capt. Wakelin, Capt. Summers.

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PERCIVAL P.56

Trim Side-by-Side Basic Trainer, with Armstrong Siddeley Cheetah 17 Engine

THESE first photographs of the new Percival P.56 basic trainer show it to be a clean-cut, sturdy design, by no means unpleasing to the eye, though somewhat marred in its present state by a tail-parachute installation and incompletely faired undercarriage. The P.56, which is powered with an Armstrong Siddeley Cheetah 17 engine of 420 h.p., first flew on February 23rd, and has since amassed nearly forty hours. The test programme to date has covered handling trials and all aerobatics, including spinning. Flying characteristics and handling qualities generally are reported to be very satisfactory. Rate of climb and rate of roll are high, and take-off run short. The aircraft has been planned with a view to maintenance and operation by semi-skilled personnel without the aid of special tools and with the minimum of ground equipment. Day-to-day engine and airframe maintenance is mostly done from outside the cockpit and fuselage.

Though the Cheetah engine has been used for many years in twin-engined training aircraft, notably the Anson and Oxford, it has not been widely fitted in British single-engined types. It is, of course, a near-relation of the earlier Lynx, which saw long service in the famous Avro 504N, or "Lynx-Avro."

Fluid De-Icing and the new AVRO SHACKLETON

As a result of recent flight tests *fluid* de-icing has been proved the most efficient and economical method of combating ice formation. No man was more conscious of the hazards of ice than our National Hero and great Antarctic Explorer Shackleton and it is therefore appropriate that the new Avro Shackleton faced with long arduous sorties in uncertain weather should be fitted with T.K.S. De-Icing equipment. Recognising the superiority of fluid de-icing T.K.S. engineers are constantly engaged in devising the most scientific methods of its application, working hand in hand with Aircraft designers.

A section of the T.K.S. installation on test. Photo by courtesy of B.E.A.C.

T·K·S *Aircraft*

DE-ICING EQUIPMENT

T.K.S. (Aircraft De-Icing) Ltd., Proprietors:

Tecalemit, Kilfrost, Sheepbridge Stokes. Drayton House, Gordon Street, London, W.C.1. *Tele.: Euston 4650. 'Grams: De-Icing Phone, London.*

CIVIL AVIATION NEWS

THE WAY OF THE HERON : Mr. Geoffrey Pike expressed himself well satisfied with the handling of the de Havilland Heron on its maiden flight at Hatfield on the evening of Wednesday, May 10th. This first flight view shows this new feeder-liner to reproduce the salient recognition features of the Dove, many components of which are, in fact, incorporated. This close relationship between the two types means that Herons can be quickly produced from existing tooling.

HATFIELD IS HAPPY

HAVING completed its tropical trials, the de Havilland Comet returned to Hatfield from Cairo last Thursday, May 11th; the journey to London was made in 5hr 39min 21.5sec. This represents an average speed of 385.91 m.p.h., which (by reason of head-winds) is hardly comparable with previous Comet performances; nevertheless, it will be submitted to the F.A.I. as a point-to-point record, for which, over this inward route, no previous figures exist.

Since it left Hatfield on April 24th the Comet had flown some 40hr, bringing its total air time to about 287hr. The tests at Khartoum and Nairobi confirmed that gas turbines are rather more sensitive than piston engines to tropical conditions, but only three man-hours had to be spent on maintenance. A minor undercarriage fault developed at Khartoum, which delayed the aircraft a few days and necessitated flying a small bracket and jacks out from England by B.O.A.C. On his return G/C. Cunningham said that the serviceability of the airframe and power units had been remarkable, and that a valuable amount of operating data had been accumulated.

The triumphant return of the Comet was not the only reason for jubilation at Hatfield last week, for, as depicted above, the Heron feederliner had made its maiden flight on the previous evening and, according to Geoffrey Pike, the pilot, had performed very satisfactorily. The Heron, designed as a replacement for the faithful Rapide, is intended for use from small airfields and on stage-lengths of up to 500 miles. It can accommodate from 14 to 17 passengers.

TALKING TECHNICALLY

THE I.A.T.A. Technical Conference now in progress at Asbury Park, New Jersey, U.S.A., is the largest annual gathering of technical and operational representatives from airlines throughout the world. Approximately 200 technicians from the 70 member-airlines are participating, together with representatives of I.C.A.O., the C.A.A., the C.A.B., Air Transport Association of America and communications organizations such as Airinc, International Aeradio and S.I.T.A.

The conference, which is the fifth of the series to be held, is discussing all airline technical matters which require present action or future planning, and its proceedings will provide a comprehensive review of all the major problems encountered by scheduled air transport operators.

Following the general meeting held on May 9th, at which the chairman was elected, the conference resolved itself into three working groups to study, respectively, communications and radio aids; engineering and maintenance; and operations. One of the major items on the agenda of the general meeting was a symposium of papers on the maintenance and operational problems of jet aircraft. Other subjects included a discussion of cross-wind components for take-off and landing and their effect on runway utilization—this included presentation of data by the Netherlands Airport Construction Company and the Goodyear Tyre and Rubber Company, Ltd.—approach lighting, airport servicing and traffic-handling problems. A three-day display of the latest airborne radio equipment such as D.M.E., I.L.S., V.O.R. and other various types of radar is

IT PAYS TO ADVERTISE : A. Cdre. Harold Primrose and Mr. Leslie F. Dyer, directors of Rotor Stations, Ltd., waiting for the weather to clear before the first helicopter service is flown (as related overleaf) from London to Birmingham. On the right is a view of the Castle Bromwich B.I.F. taken from the Westland-Sikorsky ; the landing ground, by the main entrance, is at the top right of the picture.

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being arranged for May 18th to 20th. In addition, members of the Operations working group are taking part in a demonstration flight to see the workings of the air-traffic control organization on the New York-Washington airway.

The Communications group, in particular, is reviewing airline interests in the forthcoming sessions of the International Telecommunications Union, which will assign frequencies for air-transport use on a regional basis. It is also studying reports on the effectiveness of R/T and the development of detailed procedures for air-to-ground use. Additionally, it is undertaking selection of the most suitable characteristics for LF/MF radio-ranges, Consol, and LF/MF radio beacons from the view point of night protection, identification and methods to improve antenna efficiency.

The engineering and maintenance group is reconsidering I.C.A.O.'s category "A" airworthiness requirements, which have recently been the subject of some controversy, particularly in the U.S. On the agenda of the Operations group is an examination of proposals to simplify traffic-control messages and some review of the policy on standardization of position reports and the proposed altimeter setting procedures.

The I.A.T.A. Technical Conference is undoubtedly the most important session of its kind, as its decisions and resolutions foreshadow the line which I.A.T.A. and the airlines themselves will follow in their dealings and co-operation with other governments through the medium of I.C.A.O.

A HELICOPTER MAKES HISTORY

First City-to-City Schedule : The Westland-Sikorsky B.I.F. Service

AS we foreshadowed last week, Westland Aircraft, Ltd., in collaboration with Rotor Stations, Ltd., have, by operating a two-return-trips-daily helicopter service between the London and Birmingham sections of the British Industries Fair (May 8th-19th), secured for Britain the honour of being the first country in the world to operate a scheduled city-to-city helicopter service.

The terminals between which the Westland-Sikorsky helicopter is flying are Harrods sports ground at Barnes—only a few minutes' car run from Olympia—and the main entrance of the Fair at Castle Bromwich. The schedule was due to open with the Fair on May 8th, but on that day the elements were against the service, for although the helicopter proved itself capable of flying under a cloud-base of two-hundred feet during a short demonstration, it was out of the question to allow a flight to be made through the Metropolitan Control Zone at this height. Airliners were stacked high over London and were on controlled approaches to London Airport, passing right over the Barnes Rotor Station at 500-800ft, although they could not be seen. These conditions prevailed throughout the day.

The following morning, May 9th, dawned just as misty and again Flying Control were unable to give permission for the helicopter to take off until the cloud base had lifted to 800ft; and even when this happened and the aircraft took off it had to be carefully controlled and routed out of the London area.

The first take-off was accomplished at 10.15 a.m. by pilot K. Reed, who is flying all the schedules, and the holder of No. 1 passenger ticket was Mr. Leslie F. Dyer, chairman of Rotor Stations, Ltd., who had instigated the service and organized it in conjunction with Westland Aircraft, Ltd. The other two seats were taken by Mr. C. Colin Cooper and his wife. As the machine rose from the playing field it was rapidly engulfed by the mist, the pilot having to pick his way by real Bradshaw methods out to Maidenhead. Once out of the built-up area he was enabled to descend to an even lower altitude and the flight was concluded between 300 and 600ft; visibility at times was down to 300 yards and only landmarks directly underneath could be distinguished. It appears that many other aircraft had been grounded by the weather, although shortly after the helicopter's arrival at Castle Bromwich a Rapide landed, having taken considerably longer over the trip from Northolt than the 1 hr 20 min that the helicopter had taken from Barnes.

Later on May 9th the weather cleared considerably and all schedules were completed. Passengers have since been commenting on the great smoothness and general interest of their rides, and, as they have been supplied with small bottles of sherry and smoked-salmon sandwiches for the journey, their comfort and enjoyment are easily understood.

The two directors of Rotor Stations, Ltd., Mr. L. F. Dyer and A. Cdre. H. Primrose, are, together with the Westland Company, to be congratulated on their enterprise and the hard work which went into the organization. It must also be recorded that B.E.A. graciously entered into an Associate Agreement which allowed the service to be run, though it robbed them of the prestige of claiming the forthcoming Cardiff-Liverpool service as the world's first. M.C.A. were also, it is reported, most co-operative throughout.

BREVITIES

THE Director-General of I.A.T.A., Sir William Hildred, who recently arrived in London from Montreal, described this year's air traffic as the "biggest flying operation ever." He thought that pasenger traffic would show an increase of nearly 40 per cent on last year's figures.

* * *

The first aircraft used commercially by Swissair, a 1927 Fokker F.VIIA, recently made its last flight, over the 70 km from Basle to Berne. It is to be preserved in the Postal Museum at Berne.

* * *

The Australian Minister for Air and Civil Aviation, the Hon. T. W. White, arrived in London from Sydney on May 10th. He is spending a fortnight in studying the latest types of British civil and military aircraft and will later fly to Montreal for a meeting of I.C.A.O. on May 27th.

* * *

Swissair announces that owing to the decrease in revenue which followed devaluation, it has been forced to make certain economy measures. These entail reduction or suspension of some services which hitherto have only produced small load-factors; notable among them is the Zurich-Glasgow service, which has now ceased to operate.

* * *

In the first quarter of this year, B.O.A.C. carried considerably more traffic than in the same period of 1949. The actual statistics show that 49,478 passengers flew some 105,186,523 passenger-miles against 39,944 passengers and only 88,576,949 passenger-miles in the corresponding period of the previous year. Mail and cargo ton-mileage also showed slight increases.

According to the Air Transport Association, U.S. internal air mail is expected to increase rapidly now that mail deliveries have been reduced to one a day. Most air mail is delivered overnight anywhere in the U.S., and business men, particularly, are rapidly recognizing the advantages of this service.

* * *

Having reversed an earlier decision, the C.A.B. has now recommended that the base on Shemya Island in the Aleutians should be kept open for the benefit of commercial airlines. The U.S. Defence Department is understood to have made representations on the matter; it considers retention of the base essential.

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India's Air Transport Licencing Board has granted traffic rights for all international services west of India to Air India International. The company is already planning a new route which will cover some 21,000 miles through the four continents of India, Africa, America and Europe.

* * *

Towards the end of next month Air France is scheduled to take delivery of the second Bréguet 761 Deux Ponts, now being produced in quantity at Villacoublay, near Paris. The prototype has already achieved a total of some 55 hours' test-flying, and the second aircraft is to be tested by Air France with a view to commercial exploitation. The company has ordered eight, and a further four provisionally.

* * *

To meet the increased petrol charges which have resulted from the introduction of the higher fuel tax, British charter companies, meeting at Croydon recently, agreed to increase

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their rates by 10 per cent forthwith. The new rates will still maintain the same margin between the State airlines and the charter companies' quotations.

* * *

On May 20th, Air France is to introduce a new weekly service linking New York with Milan *via* Paris. The service will have an elapsed time of 24 hours.

* * *

The M.C.A. has established a working committee to consider and make recommendations on the special requirements involved in the operation of jet and turboprop airliners. The committee will study such matters as the basic navigational facilities, air traffic control, telecommunications and meterological services needed for the safe and efficient operation of such aircraft within the next ten years.

* * *

A Constellation arrived at London Airport recently on what is probably the longest delivery flight ever made by an aircraft of its class. A 42-seat model 749, it is the first of four destined for Johannesburg to go into service with South African Airways, and had originally flown from Los Angeles. S.A.A. states that the flying time for the Johannesburg-London route will, using Constellations, be reduced by five hours.

GIVING IT ZIP: The first Miles Gemini to be fitted with Gipsy 10 engines has been delivered to a private owner, Mr. J. Holder, at Elstree; it is reported to cruise very comfortably at 145 m.p.h. with an engine speed of only 2,000 r.p.m. The work was carried out by Air Schools, Ltd., of Wolverhampton.

CLUB AND GLIDING NEWS

CAMBRIDGE Aero Club completed 119 hours flying during April, which included night flying by Messrs. G. C. Chandra and T. V. Kannabiran, both Commercial Licence candidates. The end of the month saw the total of post-war flying reach more than 8,500 hours. In this period, 111 Private Pilots' Licences and three Commercial Licences have been awarded to *ab initio* members, and seven instructors' courses were successfully completed. The club's present aircraft strength is three Tiger Moths and one Autocrat. Post-war flying rates have ben reduced from an initial £5 10s to £3 per hour dual or solo and, in spite of the recent increase in fuel tax, it has been decided that charges will remain at £3.

* * *

IN conjunction with the S.B.A.C. and Air League Trophy Races which are being held this year on July 22nd at Sherburn-in-Elmet, the Yorkshire Aeroplane Club Trophy Race, limited to aircraft of 1,750 kg in weight and to the first 12 entries only, is being arranged for the same day. The course extends over three laps of a 17-mile circuit, and the closing date for entries is next Saturday, May 20th. A handsome silver trophy will be awarded to the winner, and cash prizes amounting to £200 are being donated by the *Yorkshire Post* and the *Yorkshire Evening Post*.

* * *

AS mentioned briefly in *Flight* last week, the annual race for the Goodyear Trophy is to be held on the Sunday (June 18th) following the King's Cup Race at Wolverhampton. The distance will total 60 miles, over three laps of a 20-mile triangular course *via* Wolverhampton, Penkridge, Wheaton Aston, Wolverhampton. The race is promoted by the Wolverhampton Aero Club, and the trophy is presented by the Goodyear Tyre and Rubber Co. (Great Britain), Ltd. A flying display and joy-riding are being arranged for the same afternoon.

* * *

IN spite of rather thick weather, a number of club-members and private owners flew over from Sywell and elsewhere to have a look at the Veteran Car Club's rally and competition held at Old Warden Airfield, near Biggleswade, on May 7th. This, incidentally, was a most entertaining and educative spectacle that prompted the query as to how many 1950 cars will look as smart, and run as well, in the year 2,000—for several of these fine old warriors were born at the turn of the century.

Old Warden, if a little limited as a landing-ground, is in delightful surroundings. It is, of course, the home of the Shuttleworth collection of veteran vehicles and aircraft, the latter consisting of a 1909 Bleriot, 1911 Deperdussin, 1912 Blackburn monoplane and 1916 Sopwith Pup, all in flying order. The fine old mansion in the park now houses the Shuttleworth College—for farming and estate management—established by Mrs. D. C. Shuttleworth in memory of her son, Richard Ormonde Shuttleworth, the famous racing driver, who lost his life in a Service flying accident in 1940. The aviation side of his interests is being perpetuated by the Warden Aviation Co., which, under the management of S/L. L. A. Jackson, maintains the old aircraft and the airfield, provides hangarage for private-owner aircraft, and carries out C. of A. overhauls and maintenance work in general.

* * *

IN accordance with its declared policy of furthering the interests of advanced soaring in the Royal Air Force, the R.A.F. Gliding and Soaring Association has produced a comprehensive report on escarpment soaring sites in Northern Ireland. After reconnaissance, the investigators decided that the westerly and south-westerly escarpments of the Benevenagh Mountains offered the best sites. This high ground is situated to the east of Lough Foyle, a few miles from Londonderry—one of the two main centres of population in Northern Ireland.

Unstable air normally arrives over Lough Foyle with well-formed cumulus, while stable air from directions between west and south produces wave activity—at times, in strong winds, very pronounced. The prevailing wind is between 220 deg and 290 deg and is of soarable strength about 40 per cent of the time.

The investigation showed that these sites offer excellent soaring facilities. It is unfortunate that they are somewhat remote from the centre of population at Belfast, a rail journey of two or three hours, but Londonderry is only an hour's journey by rail or road, and there are several R.N. and R.A.F. units in the area.

This report should be of considerable value to the Ulster Gliding Club—the only civilian gliding club in Northern Ireland—and also to the R.N.A.S. gliding club at Eglinton.

* * *

ARRANGEMENTS are nearing completion for the British entry in the International Gliding Contests, Orebro, Sweden, between July 3rd and 16th. It is likely that competitors will also attend from France, Switzerland, U.S.A., Spain and Sweden. Launching will be by aero-tow, and contests will include distance and height flying, goal-flights and races.

The official British team (all of whom flew in the 1948 contests) will be flying Weihe sailplanes. There are three definite entrants: Mr. P. A. Willis, C.B.E., holder of the British National height, distance and speed records, Mr. Lorne Welch, C.F.I., of Surrey Gliding Club and recently the second man in history to soar across the Channel, and F/L. R. C. Forbes, C.F.I., of the R.A.F. Gliding and Soaring Association, and holder of the British Goal-Flight record. As in 1948, the team will be captained by Mrs. Ann Douglas.

* * *

TO encourage gliding, the M.C.A. has decided that private and club gliders are now to be exempted from the requirements of registration and Cs. of A. to which, by the terms of the Air Navigation Order, 1949, they were formerly subject. Their owners must, however, be insured against third-party liability. Although the owner of a glider will no longer be obliged to hold certificates of registration and airworthiness when flying in the U.K., he may still obtain these certificates if he wishes. New gliders, constructed for sale, will still need to have a C. of A. as a guarantee of satisfactory design and construction; this is to ensure that export of gliders is not jeopardized in any way.

AMERICAN NOTEBOOK

By
Stanley H. Evans
F.R.Ae.S., A.F.I.Ae.S.

DERBY ENTRANT

LATE entry in a trio of long-range escort-fighter prototypes now under evaluation for U.S.A.F. production honours at Muroc, the North American YF-93A has all the airmarks of a winner: which is not to imply that it will walk away with the prize from its two competitors in this class, the McDonnell XF-88 and the Lockheed XF-90, both twin-jetted heavyweights with Westinghouse J-34 (3,600 lb) axial-compressor turbojets. The YF-93A mounts a single Pratt and Whitney J-48 radial-compressor turbojet, which is the American development of the Rolls-Royce Tay, having a normal static-thrust rating of 6,250 lb without afterburner augmentation.

To avoid confusion over the latest American fighter labels, it should be explained that the escort fighter is the Air Force's new classification for what, only recently, was tagged the penetration fighter. Future U.S.A.F. fighter categories will comprise four distinct functional types, namely: (1) intercepter fighter; (2) escort fighter; (3) fighter-bomber; and (4) all-weather fighter. Current operational fighters such as the F-80, 84 and 86 are now considered as all-purpose fighters. Presumably, such long-range designs as the XF-88, 90 and 93 will be used for both categories 2 and 3, ranging from high-level bomber escort protection to low-level attack sorties. By virtue of the speed-altitude characteristics of the jet unit, their range will be much greater for high-altitude operation.

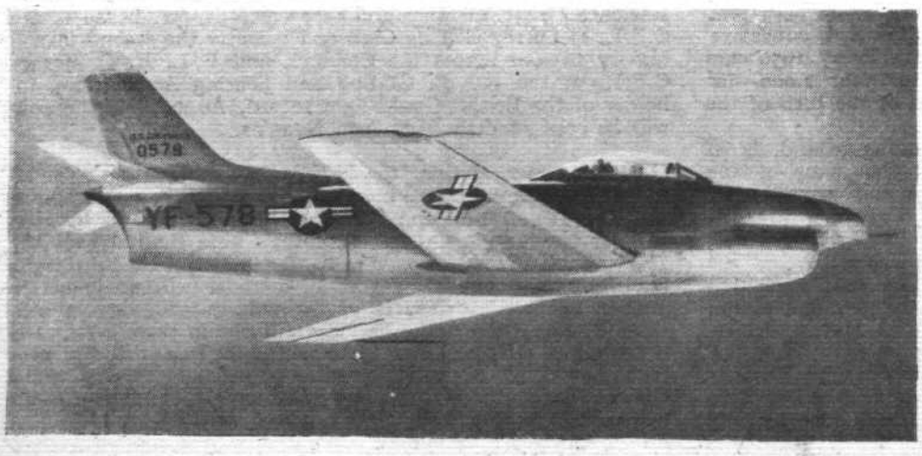
Designated originally as the YF-86C, the YF-93A was at first intended as a radar-nosed variant of the F-86 series. Power-plant changes, however, along with other equipment growth, necessitated a complete reassessment of the project into a much bigger and heavier type of fighter. This is well shown in the head-on illustration which opens these notes. The fuselage, for example, is obviously fatter and longer (44ft against 37ft) than the standard F-86A Sabre, while some idea of the weight difference may be gauged from a comparison of the respective landing gears, that of the YF-93A employing twin-wheel-abreast assemblies on each main leg. Owing to the thin symmetrical wing, these dual wheels are retracted into the fuselage at the wing junction, but because the body is nearly 7ft wide, the landing-gear track is quite reasonable, measuring 11ft on a wing span of approximately 39ft—that is, a ratio of 0.28. (By comparison, this important design feature is only about 0.22 for both the F-86A and the XF-90.) The nose landing-gear of the YF-93A is a single-wheel unit retracting forward into the fuselage nose.

Anglo-American cross-breed: The North American YF-93A long-range fighter has the P. and W. J-48 (Rolls-Royce Tay) turbojet.

To the student of aeronautical fashion trends, the most notable external features are the clean-cut radome nose of the fuselage and the concomitant form of the engine aspiration system. The latter—as might be expected from the same stable as the YF-86D (now the F-95A), reported in our Notebook entry of February 2nd, 1950—follows the current N.A.C.A. fashion in submerged air intakes sunk into the fuselage sides at the cockpit, a location which clearly foretells a short direct internal ducting with high ram-efficiency at the compressor. The large size of the entry ramp and the boundary-layer bleed duct at the mouth of the scoop are also clear evidence of the air mass requirement or lung power of the J-48 jet unit. In passing, it is of some historical interest to note that this type of divergent-walled inlet ramp was first used in full-scale practice on the Ryan XFR-4 Fireball composite-engined naval fighter as far back as 1945, so off-hand it seems a bit surprising that the research seed sown by the N.A.C.A. has taken so long to bear fruit.

Comparison of the YF-93A with the F-86A shows another interesting feature in the change in family likeness at the tail end. We have previously drawn attention to the rivet-popping propensities of the Sabre's tail, due in large measure to the low position of the horizontal unit sitting in the wing wake. In the YF-93A the horizontal surface has been lifted and the dihedral angle eliminated, while the vertical surface has been moved forward in relation to its horizontal partner. Both these changes should be beneficial from the standpoint of structural integrity and control efficacy, though whether they go quite far enough in this direction only future operational shake-down (or shake-up) will tell.

Although the wing span is roughly two feet longer than that of the F-86A, the net wing area (i.e., excluding the body cut-out) seems, if anything, to be less. If our assumption of a 7ft mean chord is near the mark, the net wing area is hardly greater than 230 sq ft, with a gross of about 285 sq ft. This point is of interest in connection with the probable gross weight, bearing in mind the long-range fuel tankage of the escort fighter class. No official release has been made of the current gross weight of the YF-93A, but a figure of 20,000 lb has been quoted in the American



Shark snoot: Redesignated F-95A for production, the North American YF-86D intercepter (General Electric J-47 turbojet) has a combat ceiling—with afterburner—of over 50,000 ft. Gross weight s 17,000 lb.

Stanley Evans

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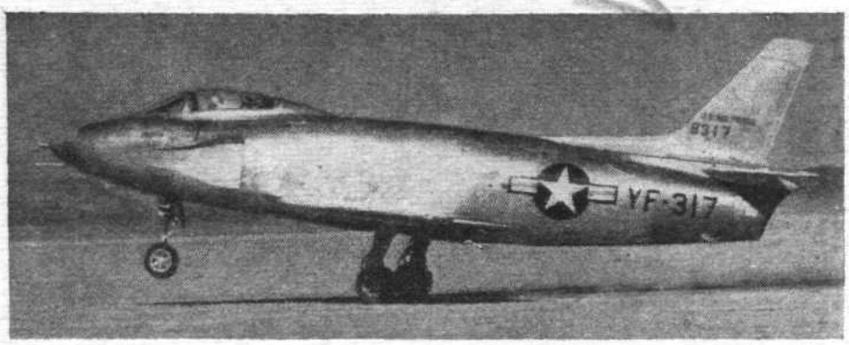
aviation Press—to start the bidding, as it were. Our own bid, however, based on the 28,000 lb of the Lockheed XF-90, would be considerably higher, say 27,000 lb. With jettisonable wing-tanks a fair certainty for long-range missions, the overload gross weight appears likely to scale the 30,000-lb mark.

Following this guestimation process, we arrive at a somewhat breath-taking wing loading of 130 lb/sq ft for a take-off gross weight of 30,000 lb and a net wing area of 230 sq ft. (Admittedly, one can juggle the wing loading down to 105 on the basis of gross wing area, but since the airflow must still get around that bluff, Falstavian body in the middle of the lift mechanism, the air particles are unlikely to be impressed with this kind of book-keeping,) Afterburner boost, plus the usual RATO (rocket-assisted take-off) routine, will come to the rescue for take-off, but the landing speed is bound to be a bit on the stimulating side, for even with the best of long automatic leading-edge slats and slotted-type flaps, the maximum lift coefficient is unlikely to be much greater than 2.0, because of the influence of wing obliquity. Thus, even with the landing weight down to, say, 20,000 lb, the YF-93A will probably touch down at around 130 m.p.h., while in a full-load emergency landing at 30,000 lb it could reach 160 m.p.h. Clearly the RATO routine is due for the reverse technique!

A maximum thrust of 8,000 lb has been publicized for the J-48 engine with the afterburner operative. Assuming that this figure refers to the static condition, a sea-level climbing thrust of around 8,500 lb and a top-speed thrust of 10,000 lb appear reasonable values in the light of current afterburner development, based on the installation of a variable-area propulsion nozzle to the tailpipe. Even so, no claim is made by North American that this would enable the production F-93 to push over the transonic hump in level flight, though an operational speed close to the sonic is predicted. The shape of the fuselage-nose entry, for one thing, looks decidedly sub-sonic; while, for another, the low fineness ratio of 6.5 or so is not conducive to low transonic drag coefficients. (In this respect, it is worth noting that its sleeker-looking rival, the Lockheed XF-90, indulges in both these transonic airmarks, for it has a needle-pointed nose and a much higher fineness ratio of about 9.0.)

Indulging ourself in, possibly, a rash performance on the shakiest rungs of the Mach ladder beyond M=0.90, we assess the maximum sea-level speed of the YF-93A at approximately 720 m.p.h. (M=0.95)—a figure which is based on the aforesaid top-speed thrust of 10,000 lb with the afterburner tap on. At 40,000ft, the corresponding maximum with the afterburner on is estimated at 640 m.p.h. (M=0.97). The sea-level speed, incidentally, happens to be the same as that predicted for the YF-86D in our Notebook entry of February 2nd, the increased drag of the YF-93A's bigger body just about neutralizing the extra 1,000-lb thrust of the J-48 engine.

In view of the high wing-loading (fluctuating around the century mark at combat gross weights), what is not so readily assessable is the handling performance upstairs in the stratospheric belt above, say, 40,000ft. The question mark that persists in writing itself across the performance chart is whether this new crop of Air Force heavyweights will be penalized because of wing-area deficiency at high altitudes. If it be assumed that this type of long-range fighter will perform its more serious combat missions within the 20-25,000-lb weight bracket, the corresponding absolute ceilings are estimated to fall within 40-45,000ft with the afterburner tap off and 49-54,000ft with it on—that is, the afterburner boost raises the ceiling about 9,000ft.



Heavyweight fighter: One of the departures noticeable in the YF-93A, as compared with its F-86A stable mate, is the moving forward of the vertical tail surfaces in relation to the horizontal. The YF-93A first flew in January this year.

These ceilings, be it noted, are the theoretical absolute values, not the practical operational or combat ceilings, which are likely to be several thousand feet lower. Bearing in mind, then, the high combat-ceiling of the opposing jet-cum-rocket intercepter, this poses the further operational query: "What happens to the long-range fuel tankage of the escort fighter should the afterburner tap have to be turned on for any considerable length of time in order to protect the bomber?" (One seems to have the choice of running out of either range or altitude!)

Perhaps such posers are outside the orbit of the design-engineer, who may be told to keep his nose to the board, and to leave the military problems to the military experts. And so, in the meantime, there is interest in recalling that, from the Anglo-American defensive viewpoint, this latest example of a British jet-unit design married to an American airframe re-establishes the wartime liaison of Rolls-Royce and North American formerly witnessed in the mating of Merlin and Mustang—a particularly happy union, by all accounts. The same kind of breeding strain—Tay crossed with Sabre—bids fair to produce another Derby winner.

STRATOSPHERIC STRAWS

SOME eighteen months ago, in an article on the trend of U.S. bomber development ("All Jet Bomber Air Force?", November 25th, 1948), we hinted that, despite detours from the stratospheric highway, caused by the compound-piston and turboprop engines, the signpost would ultimately lead us back to the turbojet, not only for short and medium ranges, but even for long-range bombing. The first two *desiderata* were generally accepted as met, but the long-range implication was not so apparent in the face of the military planners' billion-dollar faith in the Convair B-36, wherein long range has been obtained at the expense of outmoded cruising speed and small bomb load. Our own viewpoint has always been in favour of the reverse process—to exploit the high-altitude speed potentialities of the jet, gradually working up the range spectrum as the jet airframe is properly matched to its power plant. This same design strategy, incidentally, was brought out by the Navy critics of the B-36 in the recent Congressional investigation, so we

Production Stratojet: Boeing B-47As are now coming off the production line at Wichita. Approximately 75 are now on order for the United States Air Force.

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feel that we have been thinking in distinguished company.

In connection with jet-range economics we drew particular attention to the latest possibilities of the Boeing B-47 Stratojet, pointing out the widespread confusion concerning the gross weight, tankage and range of this aircraft. (Practically every aviation paper in the States fell into the trap set for them by the gentlemen who so adroitly shuffle the publicity cards.) At that time a gross weight of 125,000 lb, bomb load of 22,000 lb, a vast fuel capacity of 15,000 U.S. gallons and a picayune range of 2,000 miles, were all dealt out from the publicity pack and widely quoted, though a few elementary arithmetical notes on the cuff soon showed that none of these cards belonged to the same suit.

After rearranging them we hazarded a guess that the current take-off weight was around 155,000 lb, carrying a bomb load of 22,000 lb and a fuel tankage of 10,000 U.S. gallons, on which basis we estimated the maximum (still air) range at 5,600 miles. We further suggested that with the full built-in tankage of 15,000 U.S. gallons, the take-off gross weight could not be much less than 190,000 lb, adding that this figure hardly seemed feasible at that stage of development (1948). We also estimated that, when this stage was reached in the production B-47, the more powerful 5,000-lb J-47 turbojet (which would then be available) would enable the B-47 to reach a maximum range of 8,500-9,000 miles with a bomb load of 22,000 lb and a cruising speed of 560-570 m.p.h., mostly in the stratosphere. Absolute ceiling over the target with bombs on was estimated at 49,000ft, which meant that the probable operational ceiling would be at least 45,000ft.

As it turns out, these straws blown on the west wind were not so badly off course, for Boeing have just announced that "The operational range of the production B-47A is expected to be lengthened materially in normal flight by an additional supply of fuel made possible under new gross weight limitations." The ten B-47As with G.E. J-47 5,200 lb turbojets now under construction at Wichita, will have increased range and load capacity, droppable wing-tanks, and a maximum gross take-off weight of 185,000 lb, most of the extra weight differential being charged to increased fuel load, which is in line with our earlier figure-juggling on the basis of a maximum tankage of 15,000 U.S. gallons. Bomb load is now quoted at 20,000 lb and the service ceiling as "over 40,000ft," while the RATO boost has been increased from 18,000 to 20,000 lb, giving a total take-off thrust of approximately 51,000 lb.

A more accurate drag analysis of the B-47, plus the probability that our original altitude-cruising consumption of 0.95 lb/hr/lb was a bit too optimistic in the light of near-future jet performance, inclines us to drop our range sights by as much as 1,500 miles or so; i.e., down to 6,800-7,500 miles, if based on specific fuel consumptions of 1.0 to 1.1 lb/hr/lb at stratospheric levels where most of the cruising performance occurs. (Only the first 16,000 lb of the 95,000-lb fuel load must be consumed below 35,000ft.) Overall cruising speed will rise from about 540 m.p.h. below 35,000ft to a constant 575 m.p.h. in the stratosphere, climbing all the way to the target, and return. Cruising ceiling over the target, with bombs on (gross weight, 124,000 lb), should be not less than 42,000ft, but the absolute full-power ceiling shows up as 48,000ft with bombs on and 51,000ft after they have been released—figures which certainly bear out Boeing's modest claim of a service ceiling "over 40,000ft."

In the absence of model data on the drag-rise characteristics of the B-47 configuration at high Mach Numbers, top-speed estimates cannot pretend to be of the same order of accuracy as the rest of the performance chart. Nevertheless, since the performance art is a fascinating one, we will risk our reputation and predict a maximum of around 610 m.p.h. at 35,000 ft at the target weight of 124,000 lb, while at 45,000ft we believe the B-47A is still good for a mile or two over 600 m.p.h. This, again, backs up the Air Force's current designation of the B-47A as "a medium bomber in the 600 m.p.h. class."

The significant point to note, however, is the remarkably high cruising speed in the target area, compared with the piston-cum-jetted B-36D.

Boeing's Wichita division has recently been awarded a $303-6 million contract for 82 B-47A and B-47B Stratojets, which works out at $3.7 million per aircraft. This quantity is believed to include the ten B-47As now on the production line at Wichita. (Convair, by the way, were close runners-up in Uncle Sam's gold-coated Easter-egg hunt, receiving a 1950 contract totalling $267.8 million for 47 B-36 and RB-36s; i.e., $5.7 million each.) Boeing have also landed a $4.1 million contract for modifying one B-47 model into a four-engined B-47C (since re-designated the YB-56). According to news reports, the YB-56 will be powered by four Allison J-35-A23 turbojets, each developing 9,700-lb thrust; i.e., a total of 38,800 lb, as against the 31,200 lb of the present six-jet.

Since we believe the current Allison J-35-19 and -21 models are rated between 5,200 and 5,600 lb, it seems highly probable that the quoted figure for the -23 model is the boosted value with afterburning. (Even jet units are not given to achieving jumps of this order with the same basic model number.) If this be a fair assumption—and, of course, we are guessing in the dark—then the range may be less, but the top speed a bit higher, though not as much as might be expected, due to the aforementioned steepness of the drag rise after Mach 0.90. Our own estimate for the YB-56 would be close to 620-625 m.p.h. (M=0.94) at 35,000ft—a figure which takes cognizance of the lower pod-drag of the four-engined arrangement. It is quite conceivable that the drop in range might be recovered by increased fuel load (carried in external wing tanks), as the result of the lower power-plant weight.

What these stratospheric straws signify is a 7,000-mile 600-m.p.h. high-altitude jet bomber now coming off the production line. Another two years or so, for operational shakedown and routine perfection of the air refuelling technique, and the B-47 (or B-56) will make both the B-36 and the B-50 completely démodé. For the immediate future, Boeing would seem to be in clover—although higher up the mountainside the pasture may not be so verdant. But what of Convair? Perhaps they will make the next move with a delta-winged jet bomber, as the natural sequence to their present work on the XF-92 delta research project which, we gather, has made over 70 successful test flights so far. By slicing off the top of the drag mountain, the 800-m.p.h. jet bomber is now in sight on the supersonic side of the slope.

FORTHCOMING EVENTS

May	19.	Bomber Command Night, Royal Albert Hall.
May	19-21.	Air Tour of Sicily.
May	20.	Northamptonshire Aero Club : "At Home."
May	20-21.	Yorkshire Aeroplane Club : International Rally, Sherburn-in-Elmet.
May	25.	R.Ae.S. : 38th Wilbur Wright Memorial Lecture, by Sir Richard Fairey, M.B.E.
May	27-29.	Champagne Rally, Epernay-Plivot.
May	27-28.	Bembridge and Sandown Aero Club : Rally.
May	28-29.	Ailes d'Azur Rally, Cannes.
May	29.	West London Aero Club: S.S.A.F.A. Display, White Waltham.
June	2-4.	Tyrol Rally, Innsbruck.
June	3.	Derby Aero Club : "At Home" and Display.
June	3-4.	"Wines of Anjou" Rally, Angers.
June	3-4.	Ultra Light Aircraft Association : Rally, Fairwood Common.
June	4.	F.A.I. : General Conference, Stockholm.
June	4.	Aero Club of Normandy : Aerobatic Competition.
June	4.	Ragosine Trophy Navigation Competition, Rearsby.
June	10.	Blackpool and Fylde Aero Club : "At Home."
June	10.	Darlington Flying Display.
June	10.	Yorkshire Aeroplane Club : International Rally, Sherburn-in-Elmet, Leeds.
June	10-25.	Brussels International Aeronautical Exhibition.
June	11.	Fête Aérienne d'Orly, Paris.
June	15-18.	Benelux Air Tour.
June	16-19.	Aero Club de Roussillon : Perpignan Rally.
June	17-18.	Normandy Rally.
June	17.	Wolverhampton Aero Club : King's Cup Race.
June	18.	Wolverhampton Aero Club : Goodyear Trophy Race.
June	24-26.	Le Touquet Rally.
July	1-3.	R.Ae.C. : Members' Deauville Rally.
July	2.	Northern Heights Model Flying Club : Gala Day, Langley Airfield.
July	2-9.	Aero Club of Italy : International Air Week.
July	3-16.	Aero Club of Sweden : International Gliding Contests, Orebro.
July	7-8.	Royal Air Force Display, Farnborough.
July	8.	Wiltshire Flying Club : "At Home."
July	8-10.	R.Ae.C. : Members' La Baule Rally.
July	14-16.	Cognac International Rally.
July	22.	Yorkshire Aeroplane Club : International S.B.A.C. and Air League Cup Races, Sherburn-in-Elmet, Leeds.
July	23.	St. Albans Model Aero Club : Annual Rally, Handley Page Airfield, Radlett.
July	22-23.	Aero Club de Touraine : Tours Rally.
July	22-30.	Derbyshire and Lancashire Gliding Club : National Gliding Contests.
July	23.	International Military Air Pentathlon, France.
July 27-Aug.	5	Holy Year Rally, Italy.
July	29.	Newcastle-upon-Tyne Aero Club : Norton Griffiths Trophy Race and Grosvenor Cup Race (both International), Woolsington.
July	29.	Royal Netherlands Aero Club : International "Squadrons" Competition, Ypenburg.
Aug.	5.	Liverpool Flying Club : "At Home."
Aug.	6.	Cowes Aero Club : Display.
Aug.	19.	Association of British Aero Clubs : Summer Convention.
Aug.	19.	Swansea and District Flying Club : Kemsley Trophy Race (International), Fairwood Common, Swansea.
Aug.	26.	Wiltshire Flying Club : Thruxton Races.
Sept.	2.	Coventry Aero Club : Siddeley Challenge Trophy Race, Baginton, Coventry.
Sept.	5-10.	S.B.A.C. Flying Display and Exhibition.
Sept.	15.	Battle of Britain Day.
Sept.	16.	R.A.F. : "At Home" Day.

BRITAIN TAKES 1,000-Km RECORD

Meteor 8 Flies 620 Miles at 511 m.p.h.

SUBJECT to the usual official confirmation, Gloster test pilot J. Cooksey last Friday set up a new speed of 510.925 m.p.h. for the international 1,000-km closed circuit. For nearly four years—since June 3rd, 1946—the record had been retained by Lt. Henry A. Johnson, U.S.A.F., who flew a Lockheed F-80 Shooting Star from Wright Field over the same distance at approximately 464 m.p.h.

Mr. Cooksey's machine was a standard Meteor 8 fighter, in every way a normal production aircraft, carrying military load and a 180-gallon ventral fuel tank. From his company's airfield at Moreton Valence, Gloucestershire, he took off at 5.45 p.m. The weather was good, although haze proved a slight impediment to rapid identification of landmarks. The Meteor crossed the airfield starting line and climbed immediately to an economical cruising height of 30,000ft. Checking selected landmarks *en route*, the pilot flew almost due north (as shown in the accompanying sketch-map) to the turning point—a spot one-and-a-half miles north of Fife Ness. Rapidly he let-down the aircraft on crossing the south bank of the Firth of Forth and took it over the turning-point (where white strips had been laid out and smoke-signals were fired) beneath the prescribed minimum height of 300ft.

Jim Cooksey entering the Meteor 8 cockpit at Moreton Valence.

The return flight was also made at cruising height and speed and not until the Bristol Channel was in sight did Cooksey begin to let down for the final run-in over the timekeeper.

At Moreton Valence, the Royal Aero Club's official timekeeper was Mr. P. B. Mayne who, shortly before the record attempt, had been at Silverstone in preparation for timekeeping duties at Saturday's car races. When Gloster's bid became imminent, the company dispatched a Rapide post-haste to Kidlington, near the race-track, to collect Mr. Mayne. He arrived ready for business, with stop-watches in hand.

The total time taken by the Meteor over the 621.38-mile course was 1hr 12min 58.2sec, the speed working out at 822.256 km/hr or 510.925 m.p.h. Although Mr. Cooksey expressed slight disappointment in not having realized the hoped-for time of 1hr 10min, his flight will be accepted as an extremely creditable performance.

Mr. Cooksey, who is 37, joined the Gloster Company in 1948. He is a former R.A.F. squadron leader, and has a total of 3,500 flying hours. Friday's flight was his first record attempt.

D. B. NIVISON

IT is with regret that *Flight* records the death, at his home in Wolverhampton, of David Bruce Nivison, a well known figure in motoring and aeronautical circles.

Born in Glasgow in 1892, Mr. Nivison was apprenticed in the motor industry and his early years were spent with W. M. Beardmore and Co., Ltd. He subsequently served for some years with Westland Aircraft and with Blackburns, where he held the post of project engineer. In June, 1944, he joined Boulton Paul Aircraft, Ltd., at Wolverhampton, where he was responsible for all experimental construction, including the building of the Balliol prototypes. He leaves a widow and one son.

HERMES V PERFORMANCE

FOLLOWING a study of the performance aspects of the Hermes V, the constructors have revealed some of the figures which the proposed production version is expected to achieve. It will be recalled that the first Hermes V was shown at Farnborough last year; the second, with slotted flaps, should fly within a few weeks.

The improved version will benefit from the increased performance which the Theseus turboprops now offer, the power available from each of the four units being equivalent to a take-off rating of 2,820 h.p. It is also claimed that fuel consumption has been improved by 12½ per cent. By using slotted flaps, designed to give better lift characteristics, and a new type of D.H. airscrew, the makers are hoping to increase the maximum a.u.w. from 86,000 to 90,000 lb and also provide a considerably greater range (3,040 miles at 85,500 lb a.u.w.).

Take-off and landing runs will also be shortened and at 90,000 lb the rate of climb at sea level will be improved from 2,000 to 2,325 ft/min on four engines. At 85,500 lb. maximum cruising speeds of 355 m.p.h. and 351 m.p.h. are expected at heights of 15,000ft and 20,000ft respectively.

Meanwhile, it is learnt that the piston-engined Hermes IVs, scheduled to go into service with B.O.A.C. this summer, are to perpetuate the memory of the famed H.P. 42s used by Imperial Airways; they will accordingly bear the original names *Hadrian, Hannibal, Hengist* and *Horsa*, together with 21 other mythological variants with the same initial.

MILES PROSPECTUS CASE

THE trial of Mr. F. G. Miles and Sir William Malcolm Mount began at the Old Bailey on May 10th, and is continuing this week; at the week-end it was expected that the case would last at least another ten days.

The defendants are appearing on 24 charges arising from "false and reckless statements" alleged to have been made in a share prospectus issued on behalf of Miles Aircraft, Ltd.

A C.A.E. APPOINTMENT

IT is announced that Mr. A. D. Baxter, M.Eng., M.I.Mech.E., A.F.R.Ae S., has been appointed to the Chair of Aircraft Propulsion at the College of Aeronautics. The appointment will take effect from September 1st.

Mr. Baxter is at present superintendent of the R.A.E. Rocket Propulsion Department at Westcott. He has served with the R.A.E. since 1935 and has had a wide experience of aircraft power-plant development. He was among the first to undertake work on gas-turbine research and was associated with much of the pioneer work, particularly on the problems of combustion. Towards the end of the war he became responsible for assessment and investigation of all forms of high-speed propulsion units, including those of the German weapons.

Mr. Baxter has, for some years, been a member of several power-plant sub-committees of the Aeronautical Research Council.

CORRESPONDENCE

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

Marine "Payload"

I HARDLY feel it possible to let pass unchallenged Major Gould's statement ("Speed, Load and Diesels," Correspondence, April 27th) that "the *Queen Elizabeth's* chief cargo is not a mere handful of passengers (2,200), but freight occupying some 60,500 cu ft of space," and that "during the war she carried . . . large quantities of war materials." Admittedly, she has space for baggage, mails and high-class freight, but surely the amount provided is relatively small when compared with that available in the true passenger-cargo liner. The following is a brief comparison of the main features of the *Queen Elizabeth* with those of the *Dominion Monarch*, one of the best examples of the passenger-cargo liner, now trading between the U.K. and Australasia.

	Queen Elizabeth		*Dominion Monarch*
Gross tonnage	83,673	..	26,463
Deadweight	15,640	..	16,860
Speed (knots)	28½	..	20
Passengers	2,260	..	507
Cubic capacity of holds (bales)	212,105	..	658,960

R. H. Thornton, in the authoritative *British Shipping*, published in 1939, clearly outlines the difference between the Atlantic "mammoth" passenger liner and the smaller passenger-cargo liner in the following passage: ". . . if it were not for the contribution to the costs of the voyage made by the cargo's freight, they (the passengers) would never travel as comfortably as they do for the price they pay. For what do the great Atlantic ferry-boats charge their first-class passengers per day? About £10. And how much do the fine passenger liners carrying cargo as well? About £2 10s."

A final authoritative opinion is provided by Peter Duff in his recently published book *British Ships and Shipping*, in which he states categorically that the "Queens" are in the class of ship "designed primarily for the carriage of passengers at high speeds on regular schedules."

London, E.C.3. W. L. S. HARRISON, Secretary, Officers' (Merchant Navy) Federation, Ltd.

Strip-tearing

YOUR correspondent "Stripling" (May 11th) wonders if "tearing off a strip" had its origin in a threat to have offenders on "a narrow strip of carpet." Surely it is much more likely that it refers to unceremonious removal of a *stripe*, though how it lost the "e" is not so apparent. I well remember being threatened with this fate as far back as early 1940.

While we are on the subject of slang it would, I think, be equally interesting to debate the origin of "putting up a black." Has it, one wonders, anything to do with black marks?

Liverpool. H. C.

Nice Distinction

I WAS very interested in your article on the Royal Observer Corps in *Flight* of April 20th, 1950, in which the many problems facing the Corps to-day have been very well set out. Permit me, however, to correct one important point. It is stated in the early part of the article that the primary duty of the Corps is the spotting of aircraft. This is not so; the primary duty is the *tracking* of aircraft, which is a very different matter. Aircraft spotting was carried out during the last war on an extensive scale by roof spotters, whose duty it was to warn workers in industrial premises when hostile aircraft were approaching.

It is the duty of the Royal Observer Corps to present a continuous picture of aircraft movements overland, and this process of track reproduction involves a good knowledge of a number of subjects, of which aircraft recognition (or "spotting") is only one. It should be remembered that in the tracking of any individual aircraft, about 25 per cent of the observers involved never see the aircraft.

Bucks. F. W. FREE (Leading Observer 17/F2.)

High-altitude Interception

AFTER reading the very interesting article, "High Altitude Interception" by Mr. G. McIntosh in *Flight* of May 4th, and as a student of guided-missile design and rocket propulsion, I strongly support the view that the best defence against any future bombers or any such other weapons is the guided missile.

I would here, however, like to state that in my opinion the most effective defence would be achieved by an "automatic tracking and attacking system." Although such a system will be quite complicated, I am sure that the various advantages offered by it would be worth considering.

K. S. SIHRA

Brawdy, Pembrokeshire.

Soviet Air Routes

CONTRARY to your suggestion that Russian air-transport facilities are "normally well-guarded secrets"—to quote the statement on page 562 (Civil Aviation News), May 4th, may I point out concise and detailed tables of Aeroflot's numerous internal schedules are published in the current issue of *The A.B.C. World Airways Guide*?

This information is, in fact, so detailed that it occupies almost six pages of the guide book, and not only quotes fares, baggage allowances, excess charges and freight rates, but the different types of aircraft on each route, e.g., LI-2, IL-12, IL-18 and Yak-16. Even the distance stages for every schedule are shown in kilometres.

Glasgow. AIRLINE HISTORIAN

In Brief

A reader has "a number of copies of *Flight* from July 1st, 1943, to December 30th, 1943, inclusive," for disposal to anyone willing to pay for posting the parcel from Southampton. If those interested will reply promptly c/o the Editor (but *not* enclosing money), we will select whom we consider the most deserving recipient, since it may well be that aeronautical societies or schools are desirous of completing their files, and they should have preference. The chosen applicant will then be put in touch with the reader; we regret that other letters cannot be acknowledged.

GOODYEAR TROPHY RACE ENTRIES

WOLVERHAMPTON Aero Club announces that 22 entries have been received for the Goodyear Trophy Race, which, as mentioned on p. 623, is being held on June 18th, the day after the King's Cup Race. Racing numbers, entrants, pilots (in brackets, where not also entrants) and aircraft are listed below. Gaps in the numbers are explained by the fact that some of the aircraft will be racing under their King's Cup numbers.

1, A. L. Cole (Comper Swift); 2, B. J. Doyle (W. Alan) (D.H. 82A); 3, E. A. Wild (Autocrat); 4, W. H. Moss (Mosscraft II); 5, W. H. Moss (Mosscraft); 6, D. McCaskill (Auster Mk. V); 7, Derby Aero Club (P. Woodward) (Hawk Trainer III); 8, Derby Aero Club (J. Findlay) (Monarch M.17); 9, R. R. Paine (Hawk Trainer III); 10, F. P. Webster (L. W. Hamp) (Messenger IVa); 11, E. L. Curtis (Wicko); 12, M. Marron (S. H. Seed) (Cadet 643); 14, T. S. Murphy (A. P. Cryer) (Messenger IV); 15, W. Jamison (Proctor III); 16, E. A. Doran (D. Lowry) (Skyjeep C.H.3); 17, L. E. Mason (Hawk Trainer III); 18, D. F. Ogilvy (Miles Falcon); 24, D. C. Jemmett (Hawk Trainer III); 27, F. Dunkerley (Gemini); 35, J. Rush (Falcon VI); 36, J. N. Somers (Gemini); 37, C. G. Alington (Sparrowhawk).

AIRLINE ECONOMICS FOR THE LISTENER

THE radio is not to be compared with the lecture-hall as a medium for putting-over a technical dissertation, if only because the broadcaster cannot illustrate his arguments by the magic of the lantern; Mr. Peter Masefield, therefore, is to be congratulated on the lucidity of his "Turbine Aircraft Economics" talk to B.B.C. Third Programme listeners on April 28th.

B.E.A.'s Chief Executive showed how the turbine-powered airliner must be "matched to the job" if it was to pay its way. Taking three cases, of short, medium and medium-long hauls, he demonstrated that in the first, especially for high-density traffic, the piston-engined aircraft held the economic advantage, with the turboprop as a fair runner-up; in the second, the piston engine still led, but by a much narrower margin from the turboprop; and in the third, while the turbo-jet still remained at a disadvantage—though a much smaller one—in operating cost, the greater distance would enable its speed to be exploited to the full; traffic would flock to it, it would operate at ever-increasing load factors, and eventually it would drive airscrew types off the route.

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SERVICE AVIATION

Royal Air Force and Naval Aviation

News and Announcements

Improved Bomber Bases

IT was announced recently by the Air Minister that U.S.A.F. engineer troops were engaged in constructional work at certain airfields in the Midlands. The airfields are to be "extended and improved for the operation of modern bombers," and will be used for training by U.S.A.F. units now stationed at Marham, Sculthorpe and Lakenheath.

R.A.F. Superfortresses are to operate from these three bases in East Anglia, and the resident American squadrons will assist in conversion training of R.A.F. aircrews and groundcrews. Previously, all visiting U.S.A.F. formations undergoing 90-day rotational training in this country have flown B-29s or B-50s. The airfields now being extended would, it is suggested, be suitable bases for groups equipped with Convair B-36s or jet bombers.

ROYAL RETURN: After flying from Malta, *via* Nice, in her Viking, Princess Elizabeth (left) was met at London Airport by Princess Margaret and the Commandant, Sir John D'Albiac. Seen in the background is A.Cdre. Fielden, Commodore of the King's Flight.

Northern Auxiliaries' Dinner

THE most northerly of the Auxiliary flying units, No. 612 (County of Aberdeen) Squadron, recently held, at the Northern Hotel, Aberdeen, a most successful all-ranks dinner. The Commanding Officer, S/L. P. C. Webb, D.F.C., presided and the gathering was honoured by the presence of the Honorary Air Commodore, Sir Ian Forbes-Leith, M.B.E., D.L., Bt.

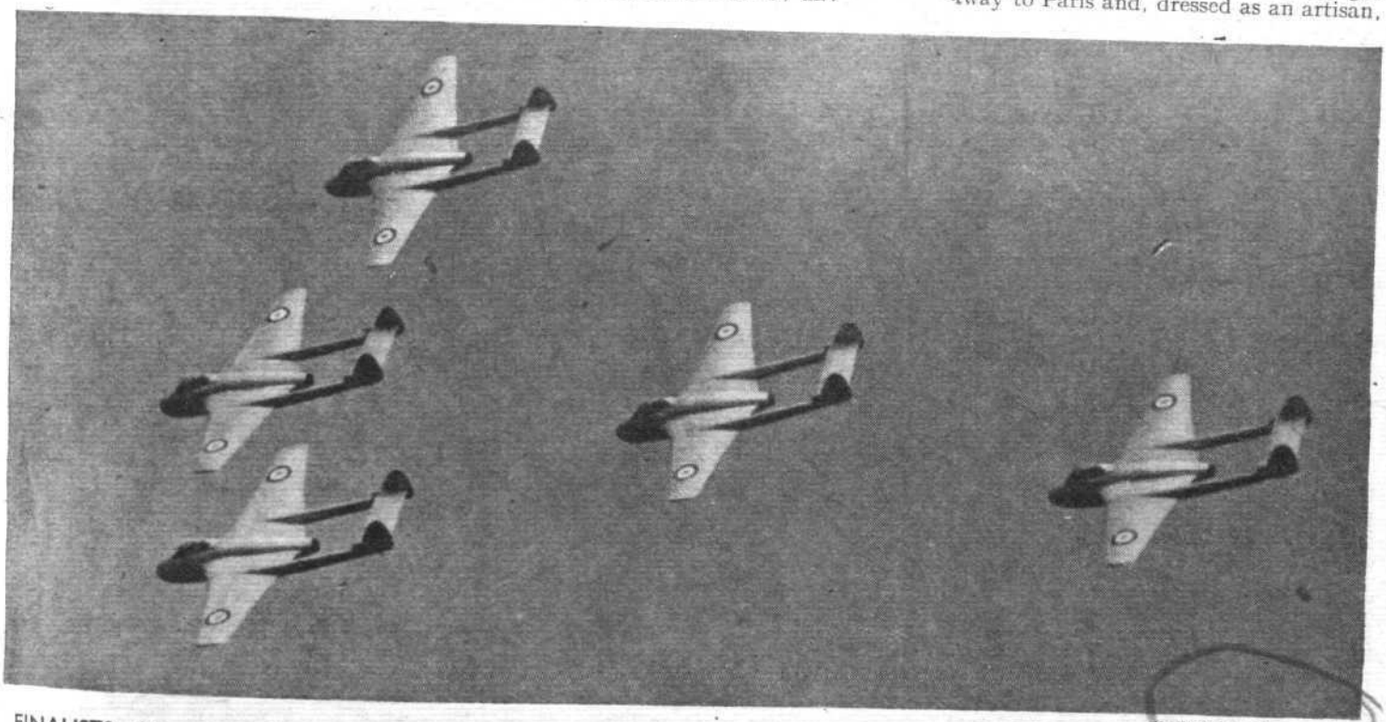
The Air Commodore had much to say that was extremely encouraging for the future of the unit, and everyone was greatly pleased at the promise of jet aircraft in the near future, to replace the present Spitfires.

No. 612 Squadron, reformed in 1946 at Dyce as an auxiliary unit, after long and honourable war service in Coastal Command, has the benefit of strong local enthusiasm, and, consequently, is manned almost to capacity. The dinner was planned to foster the Squadron spirit and strengthen the bonds for the coming summer training programme, and the gathering is to become an annual event. The highlight will be, of course, the summer camp, which this year is to be at Sylt, in Germany. The whole unit will travel there and back by air.

Thrice an Escaper

THE agility shown by Air Marshal Sir Basil Embry in escaping three times from enemy hands during the war has almost been matched by his reluctance to recount his wartime experiences. Consequently, details of a remarkable story have transpired only in brief and often inaccurate reports.

Some of the facts, however, were recently revealed by the R.A.F. Escaping Society—a select body of 500 successful escapers or evaders—and are well worthy of being placed on record. In 1940, "shortly after being shot down he got away to Paris and, dressed as an artisan,



"*Flight*" *photograph.*

FINALISTS: After competition at Tangmere, as reported on p. 604 No. 54 Squadron was selected to provide a Vampire aerobatic flight for the Royal Air Force Display next July. The Squadron's team of five Vampire 5s is shown during the eliminating contests.

SERVICE AVIATION . . .

saw Hitler enter the capital. On his last escape, when he got back to England successfully across the Pyrenees—the route trodden later by several thousand Allied airmen in the course of the war—he was obliged to fight his way clear, killing three of his guards.

"So anxious were the Germans to recapture their prisoner that they placed a price of 70,000 Reichmarks on his head, but despite this the Air Marshal resumed flying against the enemy and operated in N.W. Europe in command of a Bomber Group, which later became part of the 2nd Tactical Air Force, after D-Day."

F/L. L. A. Miller

WE regret to record that one of the R.A.F.'s most experienced sailplane pilots, F/L. Leslie A. Miller, lost his life on May 10th in a gliding accident. F/L. Miller, who was 47, was chief flying instructor of the R.A.F. Gliding Instructors' School at Detling. Recently he made an outstanding cross-Channel flight from Detling to Coxyde, Belgium, and described his experiences in a special article in *Flight* of May 4th.

R.A.F.A. Conference

HOUSING, pensions and many other problems affecting ex-Servicemen are dealt with in resolutions to be submitted during the annual conference of the Royal Air Forces Association, to be held this year at Scarborough. Air Marshal Sir Richard Peck, president of the R.A.F.A., will take the chair. Some 1,400 delegates and visitors from numerous branches of the Association will be present, and there will be representatives of all other ex-Service organizations.

During the conference H.M.A.F.V. *Bridlington* will be anchored in Scarborough Bay as a guard ship and will be open to visitors. There will also be a demonstration drop of an airborne lifeboat.

Biggest R.A.F. Band Parade

VISITORS to the R.A.F. Display at Farnborough on July 7th and 8th will see and hear the largest R.A.F. massed band ever assembled.

JUNGLE HEADQUARTERS: This thatched building houses the H.Q. of the 60th Fighter Group, Far East Air Force, based at Kuala Lumpur, which is playing a leading role in the current anti-bandit operations. Recent news of the R.A.F.'s measures against Communist terrorists in Malaya is summarized in an item on this page.

This will comprise the R.A.F. Central Band, five Regional bands, the R.A.F. Regiment Band, the Central Band of the Women's Royal Air Force, and the apprentices' bands of No. 1 School of Technical Training, Halton, and No. 1 Radio School, Cranwell. The 400 musicians will be directed by W/C. A. E. Sims, M.B.E., L.R.A.M., A.R.C.M., Organizing Director of Music in the R.A.F.

Honoured by U.S.A.F.

AN R.A.F. Superfortress pilot, F/L. A. G. Brand, who is now stationed at Marham, last week received U.S.A.F. Wings at a ceremony in the American Embassy in London. The presentation was made by Brig. John B. Ackerman, American Air Attaché, and the award was originally recommended by Lt. Col. P. K. Blair, who commands the 97 Bombardment Group.

F/L. Brand served with the 97th Group in Alaska, Texas and Kansas, and flew B-29s with the unit, during a recent two-year tour of exchange duty with the U.S.A.F. He had previously flown Lincolns from Wyton.

Home Fleet Cruise

SHIPS of the Home Fleet are this week beginning their summer cruise programme, which includes flying training, anti-submarine manœuvres, exercises with other Western Union ships and aircraft and visits to home and foreign ports and resorts. The Fleet is under the command of Admiral Sir Philip Vian, the C.-in-C., who is flying his flag in the carrier *Implacable*.

Two other carriers are included in the Fleet: The *Vengeance* (wearing the flag of the Flag Officer, Third Aircraft Carrier Squadron, Rear-Admiral C. E. Lambe) and the *Theseus*. From May 22nd-26th, the *Implacable*, supported by cruisers and destroyers, will take part in Exercise *Activity* with ships of the French and Netherlands Navies In July, the Fleet will sail from Scottish waters to visit ports in Scandinavia.

Air Operations in Malaya

THE tempo and strength of operations against the bandits in Malaya was stepped up during April by R.A.F. aircraft based in Malaya and Singapore. Lincolns, Sunderlands, Brigands, Tempests and Spitfires took part in 40 airstrikes and flew 580 sorties.

In April, Dakotas of No. 110 Squadron dropped 397,153 lb of supplies to security forces working in the jungle—the highest monthly total yet reached by any one squadron; 268 parapacks were dropped compared with 833 last month.

Since the start of the emergency the amount of supplies dropped has now reached a total of 3,186,000 lb. During April, Dakotas carried over 600 passengers and 2,000,000 lb of freight. Other activities of the squadrons included air sea patrols, photographic reconnaissance, air cover for convoys, and the dropping of 155,000 surrender leaflets. In spite of periods of bad weather with low cloud and heavy rain, 763 operational sorties were flown. Nos. 94 and 95 Squadrons of the R.A.F. Regiment (Malaya) have been in action against the bandits on several occasions, inflicting casualties and capturing prisoners and important documents.

ACTIVE VETERAN: Sunderlands of Far East Air Force have made an important contribution to R.A.F. activities in Malaya. In this scene from the flying-boat base at Seletar, Singapore, a Sunderland Mk. 5 is being towed up the slipway for overhaul.