No. 2023 Vol. LII

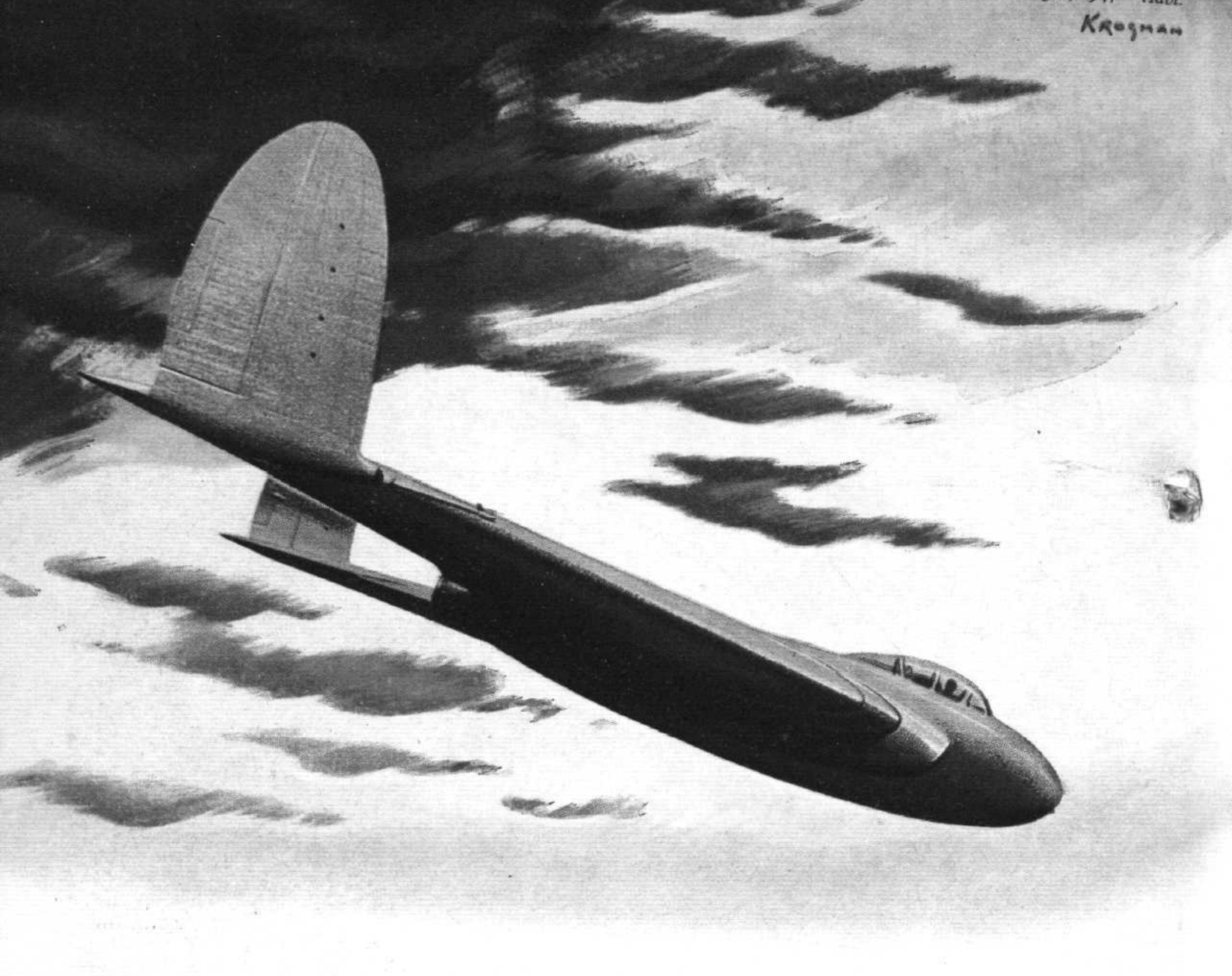
NOVEMBER 13th, 1947

FLIGHT

and AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

ONE SHILLING



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First Aeronautical Weekly in the World : Founded 1909

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams : Flightpres, Sedist, London. Telephone : Waterloo 3333 (50 lines.)

COVENTRY:	BIRMINGHAM, 2:	MANCHESTER, 3:	GLASGOW, C.2:
8 - 10, CORPORATION ST.	KING EDWARD HOUSE, NEW STREET.	260, DEANSGATE.	26B, RENFIELD ST.
Telegrams : Autocar, Coventry.	*Telegrams :* Autopress, Birmingham.	*Telegrams :* Iliffe, Manchester.	*Telegrams :* Iliffe, Glasgow.
Telephone : Coventry 5210.	*Telephone :* Midland 7191 (7 lines).	*Telephone :* Blackfriars 4412.	*Telephone :* Central 4857

SUBSCRIPTION RATES : Home and Abroad : Year, £3 1 0. 6 months, £1 10 6.

Registered at the G.P.O. as a Newspaper

No. 2029. Vol. LII. November 13th, 1947 Thursdays, One Shilling.

The Outlook

The Giants in a Fog

UNEASINESS about the future of the two huge new British aircraft types, the Bristol *Brabazon I* and the Saunders-Roe S.R.45 flying boat, was increased rather than allayed by the reply given by the Minister of Civil Aviation in the House of Lords on November 5th. It would appear that the fog which prevailed outside was reflected in the Minister's statement, and it was not even illuminated by such verbal fireworks as would have been appropriate to the day.

Lord Balfour of Inchrye asked the Government whether it had been decided that the construction of the *Brabazon I* civil airliners and the Saunders-Roe civil flying boats should be suspended in whole or part. Now that was a simple and straightforward question, and it could easily have been answered by an equally simple and straightforward reply, but Lord Nathan chose to cloud the issue by saying that he supposed Lord Balfour had in mind the reports that work on these machines might be stopped owing to the economic position. That was not so, and the future of these airliners would be considered in the ordinary way entirely on their merits."

In other words, Lord Nathan replied to a question which had not been asked, and Lord Balfour quite naturally pressed for a clearer statement. All he succeeded in eliciting, however, was that the economic position is not a factor which has been taken into account in considering the future of these aircraft. We are still left in ignorance as to what plans the Government has (if any), and we could have wished that Lord Balfour had not been prevented by his august surroundings from concluding with more telling fireworks than his "the reply does not answer my question. I am sorry."

Last week we expressed sympathy with the Minister of Civil Aviation when he was put up to reply (in the defence debate) on behalf of the Government concerning the Royal Air Force. We pointed out that Lord Nathan could not after his long absence in the Far East, Australia and New Zealand, be expected to be in a position to give authoritative replies. That excuse cannot be advanced when the subject is one very intimately concerning the department of which Lord Nathan is the political head, and one is forced to the conclusion that the fate of these two aircraft types is still doubtful, even if "the economic situation is not a factor which has been taken into account."

Engine-Off Landings

A FAMOUS aircraft manufacturer once said, in approximately these words, "The enthusiasts are always telling us that the great advantage of the helicopter is that it can go straight up. Unfortunately, if the engine stops the helicopter comes straight down." That view has been fairly generally shared, at least to the extent of believing that a safe forced landing after engine failure is an extremely tricky and delicate manœuvre which requires rather exceptional piloting skill.

This journal has done its best to dispel the idea that an engine failure inevitably means a crash, and in our issue of March 28th, 1946, we published an excellent article by Lt. Hosegood, R.N.V.R., in which he described the three main types of engine-off landing. The article was received by many with a certain amount of scepticism, the feeling being that Lt. Hosegood is very much of an expert and that, therefore, what appeared fairly simple to him might be found very difficult by a pilot of less skill.

There the matter has pretty well rested until now. In this issue we publish the first instalment of an account of a lecture given recently by Mr. Fitzwilliams to the Helicopter Association on the subject of engine-off landings. Without resorting to involved mathematics, Mr. Fitzwilliams explains as simply as the subject allows the factors involved in making use of cyclic and collective pitch control from glide approaches, and in so doing he gives chapter and verse, as it were, from the designer's point of view for the manœuvres which Lt. Hosegood described.

The article deserves careful study by all who are interested in the helicopter. The concluding instalment, which will be published next week, gives Mr. Fitzwilliams's ideas on the greater ease with which future helicopters with heavier blades should be capable of being landed without engine.

Jets and Carriers

THE welcome news, reported in this issue, that the Supermarine Attacker has successfully made its first deck-landing trials brings to mind the whole subject of high-performance aircraft in their relation to aircraft carriers. Designers are being set more and more difficult problems, and hitherto they appear to have succeeded rather well. But the question does arise how much longer must the harassed aircraft designer go on shouldering the whole burden?

In the main, aircraft carriers have not altered fundamentally since quite early days. True, they have added assisted take-off devices to their equipment, and the modern arrester mechanism is a little more of an engineering job than were the ropes and sandbags which littered the decks when Sopwith Pup biplanes with rotary engines of 80 h.p. or so, and weighing less than a Tiger Moth, were first tried. But it does seem that the next step should be up to the designer of the carrier rather than the designer of the aircraft.

The Navy will have to make up its mind whether it will sacrifice performance in the much more advanced aircraft types of the future, due to the need to design them for the carrier, or whether the policy will not, from now on, have to be more in the direction of entirely new ideas in carrier design.

During the full-day debate on naval aircraft design, held by the Royal Aeronautical Society earlier this year, Mr. W. S. Farren made some interesting and significant suggestions on this subject. He pointed out, it may be recalled, that no one had yet made full use of the enormous power supply available in carriers, and that this should be capable of projecting aircraft into the air at a much higher rate than any combination of the aircraft's own power plant and catapults and rockets. He made the further point that the carrier was the only kind of airfield on which it seemed practicable to transfer the shock-absorbing mechanism from the aircraft to the deck.

It is to be hoped that these suggestions have been duly pondered by the Admiralty.

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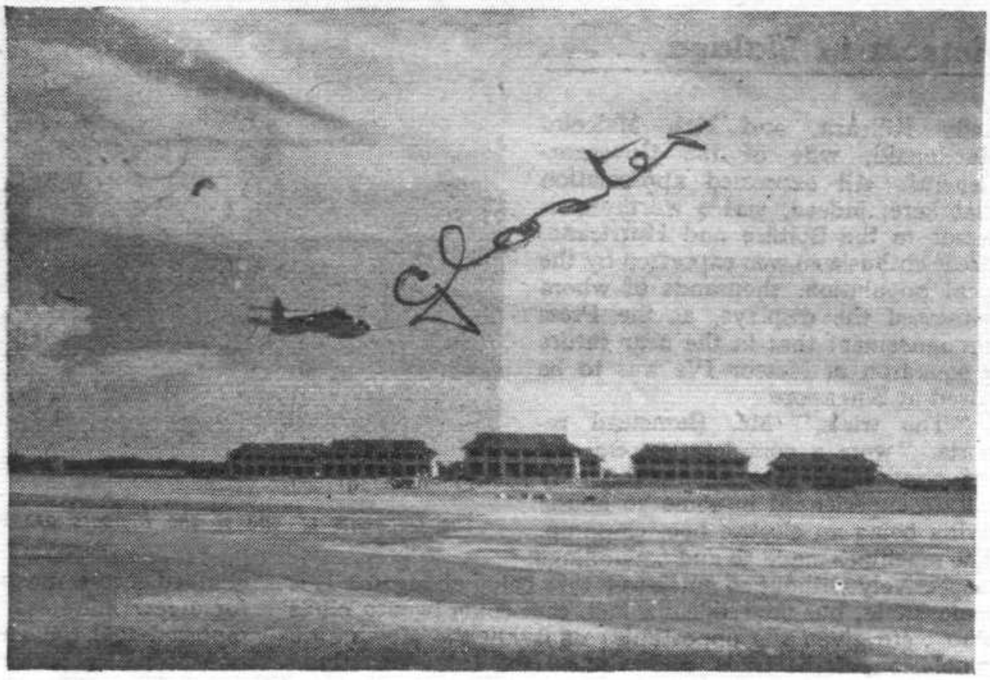
Forthcoming Events, page 540.

HERCULEAN EFFORT: The 25-million-dollar Hughes Hercules flying boat, the price and progress of which have been the subject of a Congressional investigation, is seen prior to taxying tests on November 2nd, during which it became airborne (see page 559). Roughly half as large again as the Saunders-Roe S.R.45, this wooden prototype has been under construction since March, 1943. The eight engines are Pratt and Whitney Wasp Majors.

Meteors in Malaya

A Gloster Representative Describes Recent Service Trials



One of the two short-span Mark IV Meteors at speed over Tengah airfield, some fifteen miles from Singapore.

MR. L. BUMSTEAD, of the Gloster Aircraft Company, Ltd., Mr. H. Gerrard, of Rolls-Royce, Ltd., and a party of four N.C.O.s from Air Ministry Department S.M.7, were lately responsible for erecting and preparing two Gloster Meteor IV fighters (two R-R. Derwent Vs) for tests in Malaya. We are indebted to Mr. Bumstead for an account of his experiences.

The home of the Meteors in the Singapore area was at Tengah, an R.A.F. station fifteen miles from the town and lying amid rubber and coconut trees. "For all its primitive setting," writes Mr. Bumstead, "Tengah is equipped with the most modern runways, hangars and quarters—a glimpse of the renewed defences at Singapore, and an assurance that no one will again walk in with impunity and take that island by force.

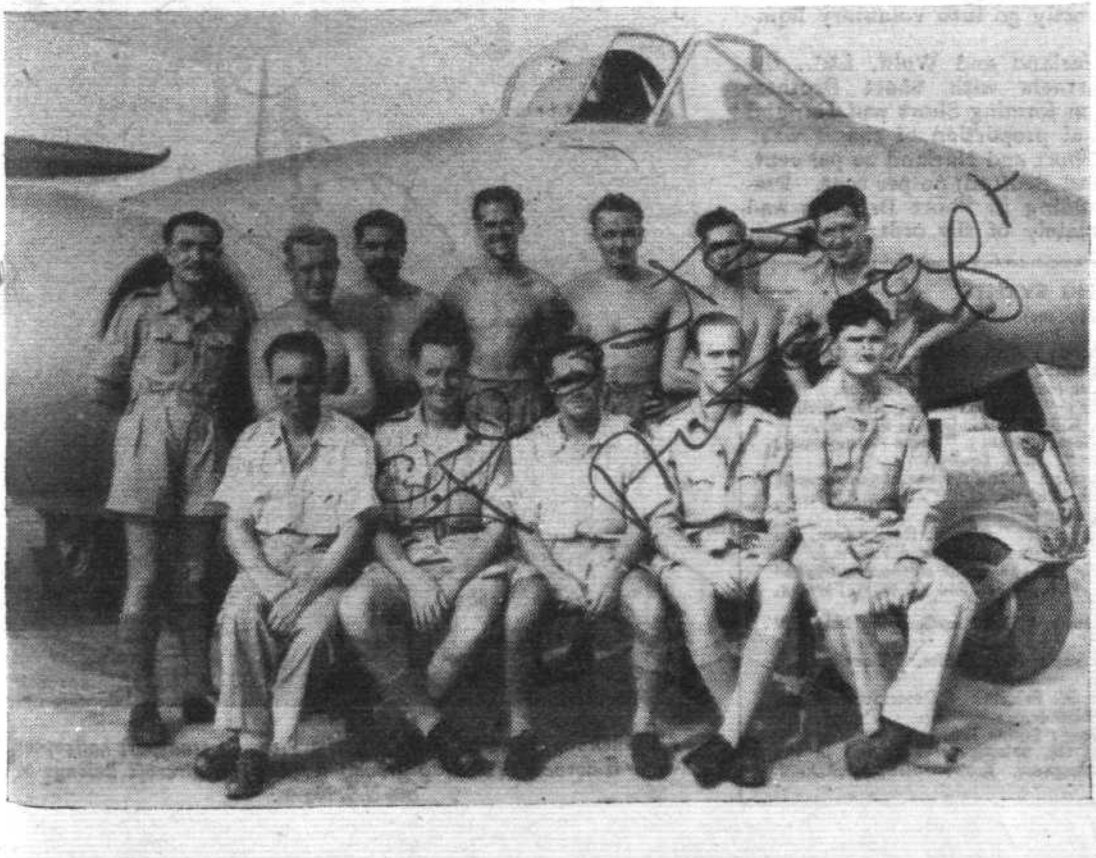
"Work did not commence immediately," he goes on, "as such items as the erection jigs, jacks, etc., had not arrived; however, after wasting a whole week we decided that they had been 'lost in the post' and proceeded with ropes, overhead gantries and a lot of grunts and groans. Despite the adverse conditions of working, due to temperature and lack of equipment, a fully assembled machine was ready for test flight within a week. This, coupled with the fact that only three of our party of six had previously worked on this type of aircraft, serves as a fitting tribute to our Chief Designer, especially so as the time mentioned for erection also included the uncrating and cleaning-off of anti-corrosive substances used for weather protection in transit.

Service Appreciation

"Both aircraft were subsequently flight-tested by W/C. Bird-Wilson, who expressed his pleasure concerning their handling qualities and announced them as O.K. for service, at the same time amply repaying our hours of checking and cross-checking with the simple words of acknowledgment, 'Whizzo, boys. A good job.' I should like here to pay a tribute to the 'Winger' who gave every assistance possible to us all and, being always ready with a cheery word, made working with him easy and pleasurable.

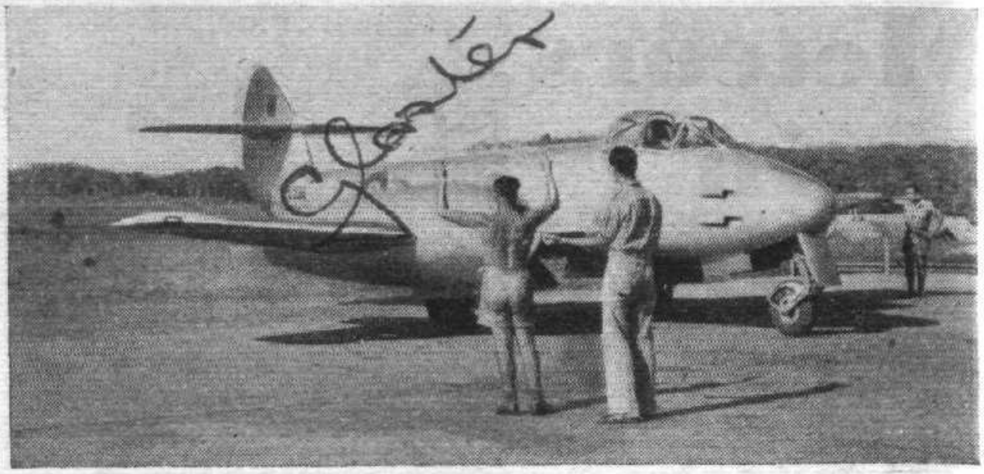
"The trials served a threefold purpose, for, apart from providing performance figures and 'airfield suitability' data, they brought to the people of Malaya a glimpse of things to come in a new era of air protection."

The Meteors were flown to every airfield within 500 miles of Singapore, one by W/C. Bird-Wilson, and one by F/L. Wilson, of No. 74 Squadron, Horsham St. Faith. Several air displays were given (reference to these has already been made in *Flight*) before such notabilities as Their Highnesses the Sultans of Salangor, Pahang, Trengganu, and Kalantan, Air Marshal Sir George and Lady Pirie, Sir Edward Gent, Lord and



Personnel responsible for erecting and flying the Meteors at Tengah. In the centre is W/C. Bird-Wilson; next to the Wing Commander (right) is F/L. Wilson and at the extreme right of the picture is Mr. Bumstead, Gloster representative.

Meteors in Malaya . . . . .



The Derwents of one of the Meteors are run up prior to a test flight at Tengah.

Lady Killearn, and Mrs. Malcolm Macdonald, wife of the Governor-General. All expressed appreciation that here, indeed, was a worthy successor to the Spitfire and Hurricane. Great enthusiasm was expressed by the local population, thousands of whom witnessed the displays, at the Press announcement that in the near future a squadron of Meteor IVs was to be based at Singapore.

"The trials," Mr. Bumstead reports, "were a complete success and the serviceability excellent, the only failure experienced in some 70 hours' flying being an electric booster pump. The machines made 50 and 60 landings respectively without so much as a tyre being changed. It is remarkable, but neverthless a fact, that some twenty pilots who were given the opportunity of flying the Meteors on conclusion of the trials, and who ranged from the 'Spit' boys of 28 and 60 Squadrons to pilots of ponderous Sunderlands, were all passed off without incident, though some of these lads had previously no experience of 'twins' or 600-m.p.h. aircraft whatever. Agreement was unanimous that the jet was by far the easiest high-speed machine they had handled and all expressed particular enthusiasm for the ailerons and landing characteristics.

"Temperature and extreme humidity appeared to have no effect at all on the aircraft, though the former certainly did seem to affect the pilots who, wearing only shorts, climbed into a machine that had been standing in the sun for a few minutes!" Temperatures during the trials are reported to have varied between 80 and 90 and the relative humidity between 80 and 100. This, without doubt, was "sticky," but personally Mr. Bumstead found the most trying of all experiences was a ride to town with a Chinese taxi driver. The manner in which these drivers pull away from traffic lights in top (not with La Salles and Buicks, but with Morris and Austin Eights and Tens) left him aghast. The cost of living he found to be at least twice as expensive as in this country—beer costs 8s 4d a bottle.

On behalf of W/C. Bird-Wilson, F/L. Wilson, Mr. Gerrard and himself, Mr. Bumstead expressed his thanks to Nos. 28 and 60 Squadrons for their hospitality.

AERIAL DISARMAMENT

A HIDDEN dump of arms has been brought to light as the result of the dropping of 10,000 leaflets over the Kuala Lumpur area of Malaya by R.A.F. aircraft.

SHORTENING THE ODDS?

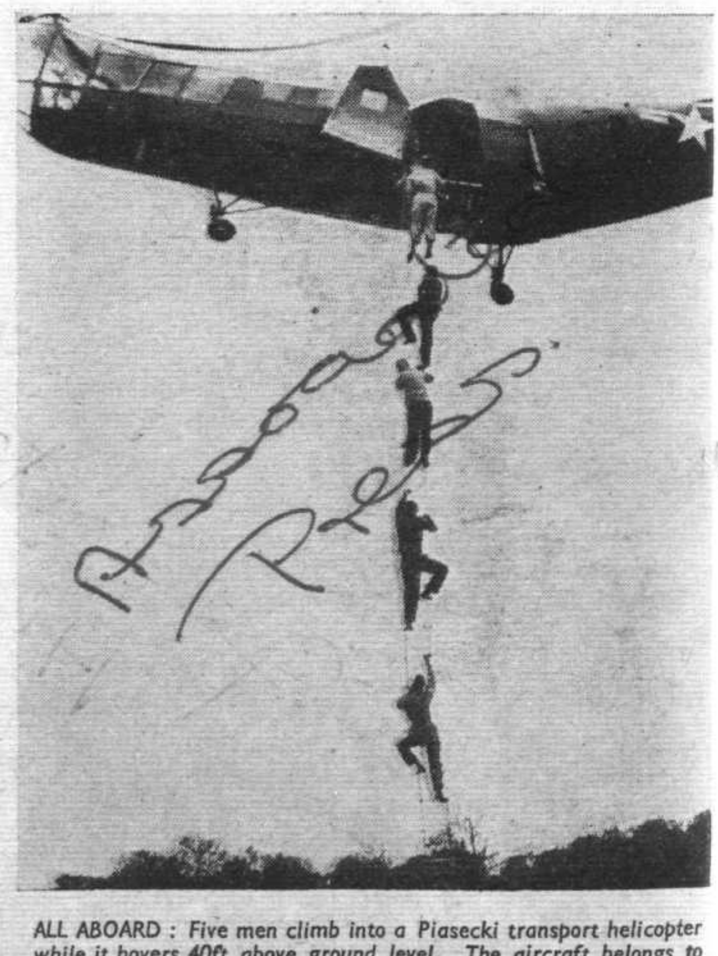
RESOLUTIONS were adopted at an extraordinary general meeting of Short and Harland, Ltd., Belfast (held in London on November 5th) to change the name of the firm intc Short Brothers and Harland, Ltd. The ordinary share capital is to be increased, for the purpose of acquiring part of the undertaking of Short Brothers (Rochester and Bedford), Ltd. The latter company is about to change its name to S.B. (Realisations), Ltd., and will shortly go into voluntary liquidation.

It will be recollected that Harland and Wolff, Ltd., the famous shipbuilders, were partners with Short Brothers (Rochester and Bedford), Ltd., in forming Short and Harland in 1936. We believe the original proportion of shares was: Harland and Wolff 20 per cent, Short and Harland 20 per cent, and Short Brothers (Rochester and Bedford) 60 per cent. Presumably, therefore, the shareholding in Short Brothers and Harland Ltd., will be approximately of the order of 20 per cent held by the company shareholders and 80 per cent by the Government. The exact ratio has not been announced.

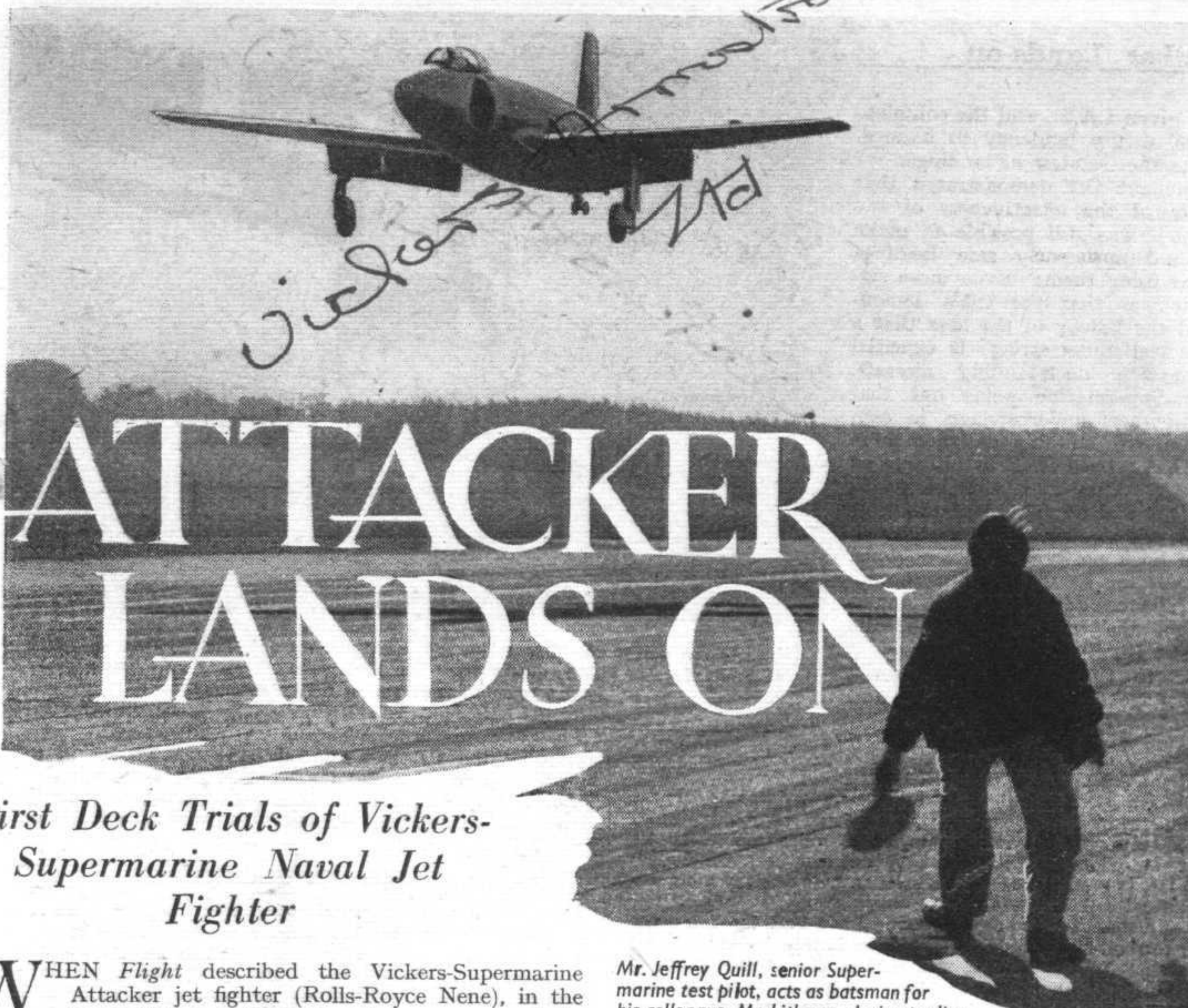
The board of directors of Short Brothers and Harland, Ltd., will include the present directors of the two firms now combined, with Mr. E. D. A. Herbert, O.B.E., M.A., as chairman.

FORTHCOMING EVENTS

Nov. 19th.—R.Ae.S. (Graduate and Student). "Aircraft Photography." John Yoxall.
Nov. 19th.—Aircraft Recognition Society: Talk by Mr. A. V. Cleaver, British Interplanetary Society.
Nov. 29th.—Pathfinder Ball, Dorchester Hotel, Park Lane, London.
Dec. 4th.—Royal Aeronautical Society: "Problems Facing Civil Airline Operators." N. E. Rowe, C.B.E., B.Sc., D.I.C., F.R.Ae.S.
Dec. 6th.—Helicopter Association of Great Britain: "Some Aerodynamic Problems of the Helicopter." H. B. Squire.
Dec. 7th.—Royal Institution of Gt. Britain: "The Advent of the Aircraft Gas Turbine." A. Cdre. F. Whittle, C.B.E., M.A., F.R.Ae.S., Hon. M.I.Mech.E.
Dec. 12th.—R.Ae.S. (Graduate and Student). "Aircraft Design from the Airline Point of View." Christopher Dykes, A.F.R.Ae.S.
Dec. 18th.—Royal Aeronautical Society: "The Work of the High-Speed Tunnel." Prof. A. Thorn, M.A., D.Sc., and W. G. A. Perring, F.R.Ae.S.
Jan. 7th.—British Interplanetary Society: "The Man-Carrying Rocket." R. A. Smith.
Feb. 14th.—British Interplanetary Society: M.O.S. film, "Development of Rocket Flight."
Feb. 28th.—Helicopter Association of Gt. Britain: "Description of the Bristol Type 171" Raoul Hafner.
Mar. 5th.—British Interplanetary Society: Brains Trust.
April 3rd.—Helicopter Association of Gt. Britain: "Problems in the Design of Multi-Rotor Helicopters. J. S. Shapiro, A.F.R.Ae.S.



ALL ABOARD: Five men climb into a Piasecki transport helicopter while it hovers 40ft above ground level. The aircraft belongs to the U.S. Navy.



ATTACKER LANDS ON

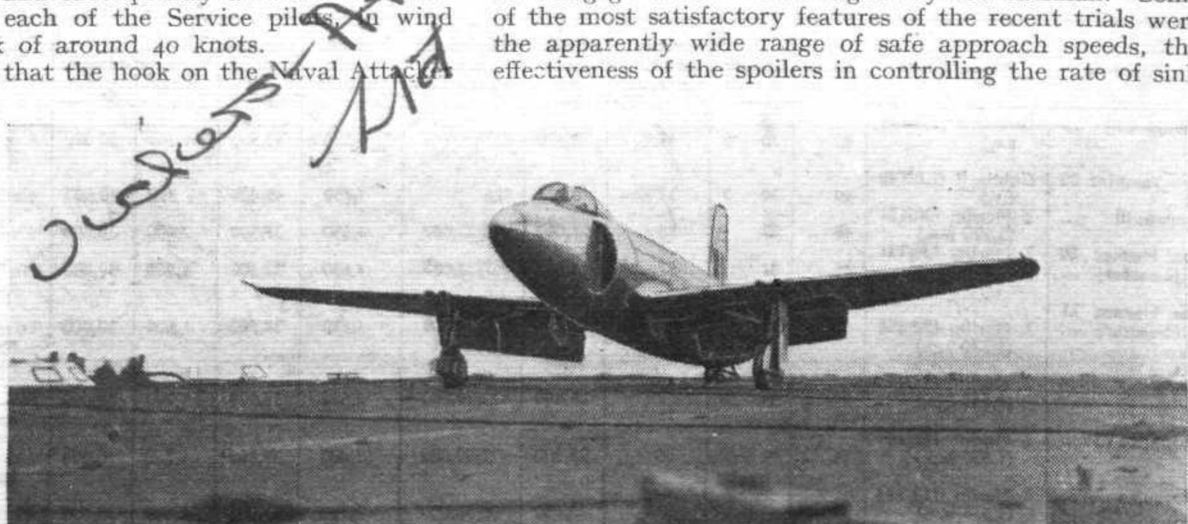
First Deck Trials of Vickers-Supermarine Naval Jet Fighter

Mr. Jeffrey Quill, senior Supermarine test pilot, acts as batsman for his colleague, Mr. Lithgow, during preliminary trials on the dummy deck at Chilbolton.

WHEN *Flight* described the Vickers-Supermarine Attacker jet fighter (Rolls-Royce Nene), in the issue of May 15th, 1947, reference was made to a Naval version with deck-landing equipment. We are now able to record that initial deck-landing trials have been successfully completed by one of these aircraft aboard H.M.S. *Illustrious.* Three pilots took part—Mr. M. J. Lithgow (assistant Supermarine test pilot); Lt. Cdr. E. M. Brown, O.B.E., D.F.C., A.F.C. (Royal Aircraft Establishment, Farnborough); and Lt. S. Orr, D.S.C., of the Aircraft and Armament Experimental Establishment, Boscombe Down. The trials occupied two days—October 15th and 28th—and twelve landings were made.

If only because the Naval Attacker was the first jet aircraft with tail-wheel undercarriage to land on a ship, the tests were of particular interest and value. Mr. Lithgow landed-on first, and subsequently a number of landings were made by each of the Service pilots, in wind speeds over the deck of around 40 knots.

It may be recalled that the hook on the Naval Attacker is of the normal type, situated aft of the tail wheel, and that the main undercarriage embodies legs developed originally for the Seafang. These legs are of a special long-stroke "pre-retraction" type and are characterized by a very high energy absorption and low rebound ratio. Another respect in which the Naval version differs from the first prototype Attacker is in having "lift control" in the form of spoilers operated by the pilot. These were incorporated to overcome the disadvantage previously encountered on jet aircraft arising from the fact that with no airscrew, and consequent lack of slipstream effect, it was not possible adequately to control the rate of sink at low speeds. With the spoilers, the pilot approaches at a fixed throttle setting and controls the approach by means of the spoilers, extending them fully on being given the "cut" signal by the batsman. Some of the most satisfactory features of the recent trials were the apparently wide range of safe approach speeds, the effectiveness of the spoilers in controlling the rate of sink



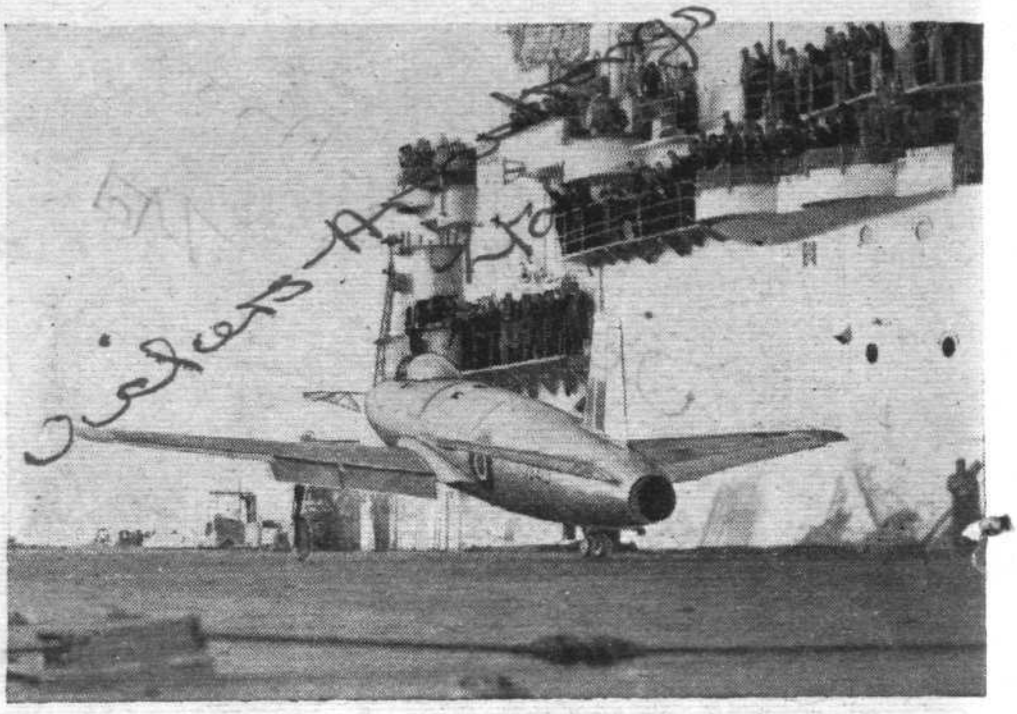
The first landing-on. Behind the double tail-wheel the arrester hook is visible.

Attacker Lands-on . . . . .

at any given I.A.S., and the complete absence of any tendency to bounce, even on the heaviest of landings.

Lieutenant Orr demonstrated that in spite of the effectiveness of the spoilers it was still possible to make good and apparently safe landings without using them. Even more significant was that the trials demonstrated the fallacy of the idea that a nose wheel undercarriage is essential for modern deck-landing aircraft. Vickers-Supermarine point out that the tail-wheel undercarriage, in conjunction with suitably designed main oleos, has proved itself practicable on the deck. They add that the saving in weight and avoidance of problems of nose-wheel strength and stowage, and of hook positioning, are obvious.

Except for its deck-landing equipment, spoilers and long-stroke undercarriage, the naval version of the Attacker (to Specification E.1/45) is similar to the land-based version. The top speed approaches 600 m.p.h.



Mr. Lithgow makes the first take-off in the "Navalised" Attacker from the deck of the Trials Carrier, H.M.S. Illustrious. The trials were witnessed by representatives of Service establishments and of the constructors.

"SUPERSONIC SICKNESS" INVESTIGATIONS

RESULTS obtained to date by the investigations of the Ministry of Supply and de Havillands at Farnborough and Hatfield into the effects of supersonic vibrations from jet engines on pilots and workers have not yet been concluded, but so far, it is stated, there has been no indication of a higher-than-normal sickness rate.

Experiments at Farnborough have shown that the two areas of greatest intensity of noise are immediately behind the jet and in front of the intakes, and that in the control cabin of the test beds the noise is not great. Means of reducing noise being tried include baffle structures and jets of water.

K.L.M's AERIAL SURVEYS

A THIRD aircraft of the K.L.M. Air Photography and Survey Division left Amsterdam recently to join two K.L.M. machines which have been conducting aerial surveys of 31,000 square miles of undeveloped territory in the northern half of Surinam, Dutch Guiana.

Maps to a scale of 1 : 40,000 are being compiled and will help geologists and engineers in making investigations into the nature of the soil and minerals, the possibilities of cattle-breeding, agriculture and the plentiful timber supplies.

Later this year, a contract for a detailed examination of 90,000 square miles in the valley of Orinoco is to be undertaken.

B.E.A. IN HAMBURG

THE transfer of Hamburg's Fuhlsbüttel airport from R.A.F. control to the civil Control Commission has been followed by the opening of a new town terminal in the Hapag building by British European Airways. Mr. H. V. Berry, regional commissioner, was invited to attend the opening of the terminal on November 10th. Besides the Corporation's own Northolt-Hamburg-Berlin daily services, B.E.A. also deals with those of Sabena, D.D.L. and A.B.A. at Hamburg, while it acts as agent for C.C.G. in the handling of all services and aircraft.

R.A.F. REGIMENT, MALAYA

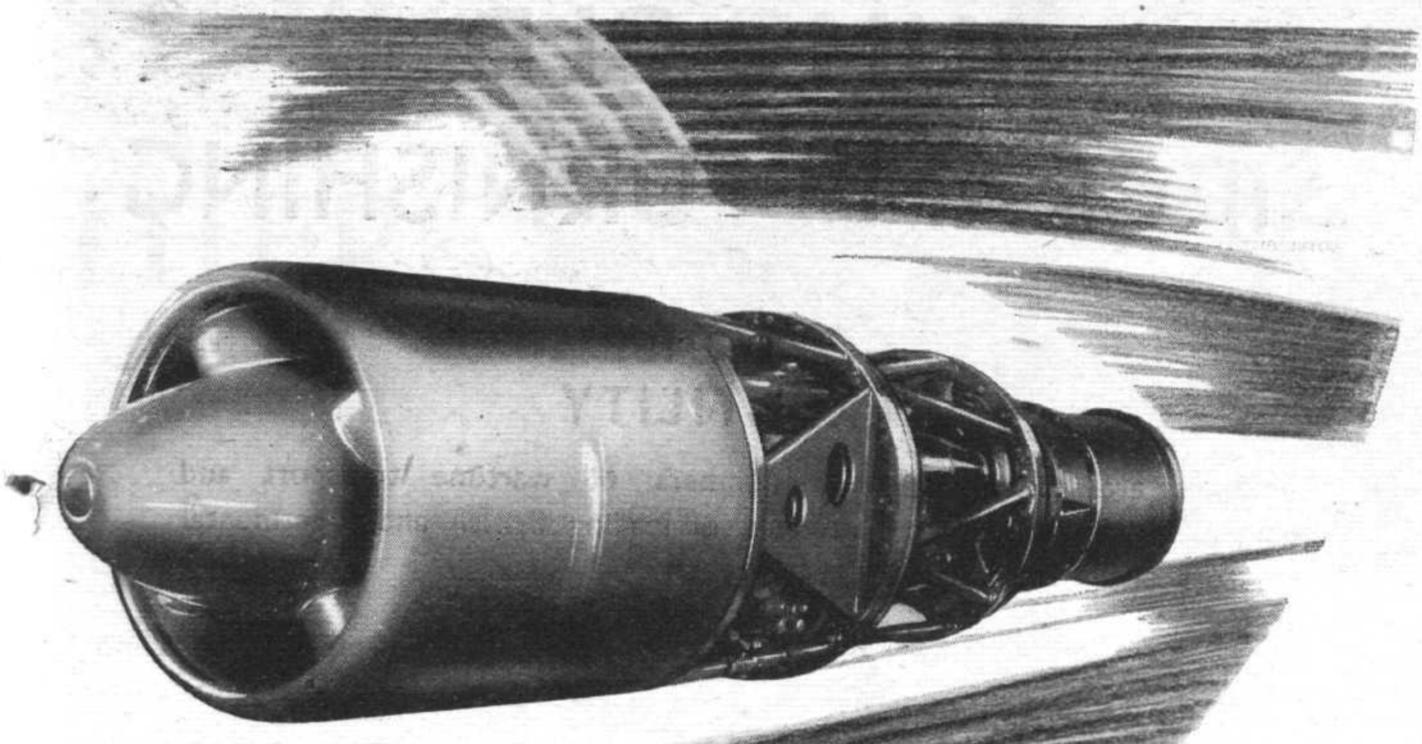
FROM all over Singapore Island hundreds of young Malays have applied for enlistment in the newly formed R.A.F. Regiment, Malaya. They will serve for a period of five years, their main duty being the defence of airfields.

VAMPIRE, HORNET AND MOSQUITO

COMPARISONS between current R.A.F. and Naval variants of the de Havilland Vampire, Hornet and Mosquito are afforded by the latest data, supplied by the firm and reproduced herewith. The figures for the Sea Hornet 21—representing a new class for use as a night fighter or strike-navigator—are of particular interest.

Aircraft	Power plant	Span ft	Span in	Length ft	Length in	Wing Loading (lb/sq ft)	Max a.u.w. (lb)	Max speed (m.p.h.) at height (ft)	Initial Climb (ft/min)	Service Ceiling (ft)	Range at Height (miles)	(ft)	Remarks
Vampire III ...	Goblin II (3,000lb s.t.)	40		30	9	45.8	12,170	531	4,350	43,500	1,145	30,000	4 x 20mm guns. 8 x RP or 2 x 500lb bombs
Sea Vampire 20	Goblin II (3,000lb s.t.)	40	-	30	9	33.5	8,937	526	4,750	45,000	390	30,000	4 x 20 mm guns
Hornet III ...	2 Merlin 130/131 (1,770 h.p.)	45	-	37	-	58	21,060	472/22,000	4,650	37,500	2,600	30,000	4 x 20mm guns
Sea Hornet 20 (1-seater) ...	2 Merlin 130/131 (1,770 h.p.)	45	-	37	-	57	18,530	467/22,000	4,650	37,500	1,500	30,000	Medium-range fighter } 4 x 20mm guns. 2 x 1000lb bombs, or 2 mines, or drop tanks.
Sea Hornet 21 (2-seater) ...	2 Merlin 130/131 (1,770 h.p.)	45	-	37	-	61	19,850	462/22,000	4,650	37,500	1,500	30,000	Long-range night fighter or strike-navigator
Mosquito PR34	2 Merlin 113/114 (1,535 h.p.)	54	2	41	2	57	25,500	422/30,000	2,400	37,000	3,500	30,000	No armament. Vertical or oblique cameras.
Mosquito B35 ...	2 Merlin 113/114 (1,535 h.p.)	54	2	41	2	56	25,200	422/30,000	2,400	37,000	1,750	30,000	1 x 4,000lb bomb or 4 x 500lb bombs and one camera.
Mosquito NF38	2 Merlin 113/114 (1,535 h.p.)	54	2	41	2	53	23,600	400/30,000	2,400	37,000	2,100	30,000	4 x 20mm guns.

N.B. All ranges include a combat allowance of 15 minutes.



Napier "NAIAD"

PROPELLER TURBINE ENGINE

Total E.H.P. - 1590
Diameter - - 28 inches.
Weight - - - 1095 lbs.

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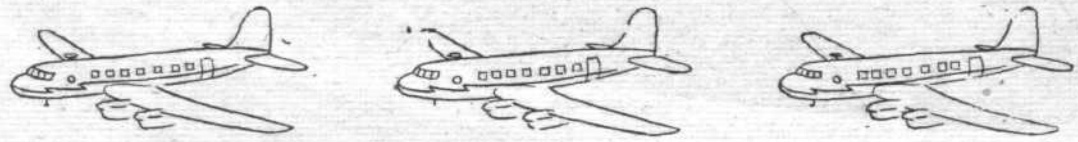

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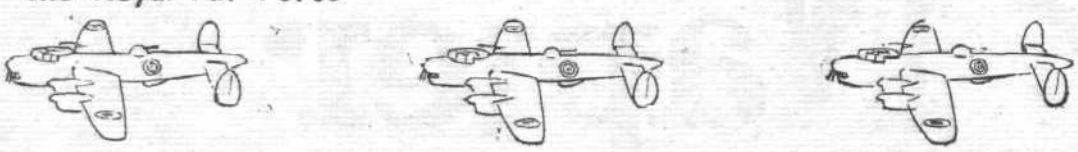

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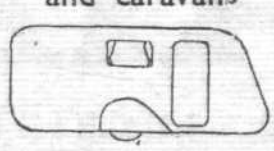

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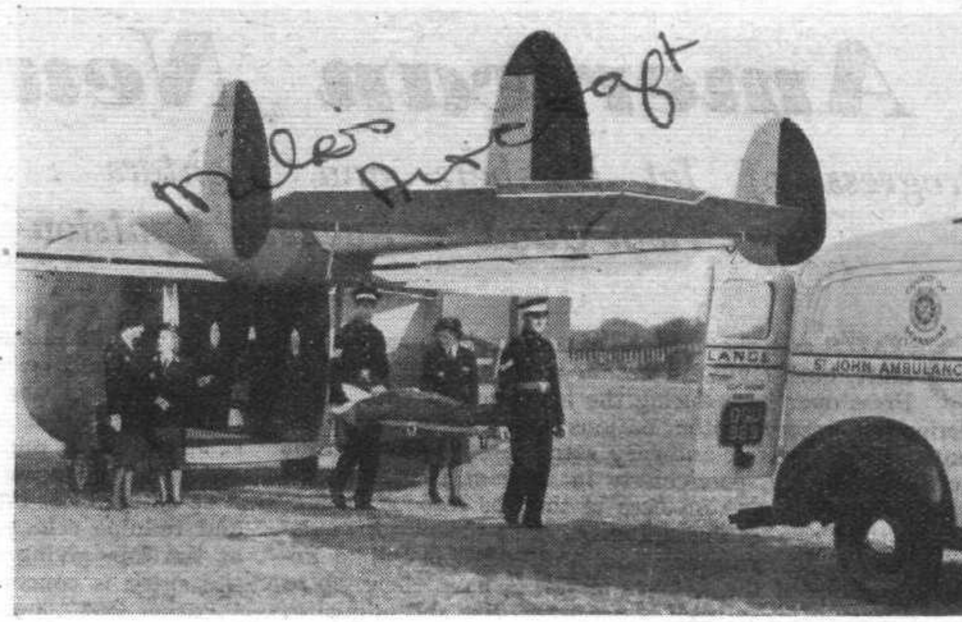


BLOSSOMING FORTH: *An air unit, of which Mrs. F. G. Miles is County Officer, has been formed by the Berkshire branch of the St. John Ambulance Brigade. The unit has 20 members, all with flying experience, and a Miles Aerovan is used as an air ambulance.*

Kenward Memorial Fund

AS a memorial to the late Sir Harold Kenward, a director of Dunlops, a research fellowship in industrial administration is to be founded at St. Catharine's College, Cambridge. The trustees are Sir Miles Thomas, Sir George Beharrell, Sir Reginald Rootes, Mr. C. E. Wallis and Mr. K. C. Johnson-Davies. An appeal for £25,000 to endow the memorial is being made.

Approved Agency

OFFICIAL confirmation has been received that the Royal Air Forces' Association has been appointed an approved employment agency under the terms of the Control of Engagements Order, 1947. Over 5,000 officers, airmen and airwomen have been found jobs by the Association.

High-speed Tunnel

IT is reported that a new wind tunnel now under construction at the Technical Institute in California—presumably the California Institute of Technology at Pasadena—will give air speeds of 3,600 m.p.h. Although there is no intrinsic reason why this should not be done, the speed is so very high that we wonder whether a typographical error has not occurred in the report. In any event, if the power input to the driving fan is to be kept within reasonable bounds, for a speed of this order the tunnel dimensions would need to be so small that the real value of any results obtained might be questionable.

Interplanetary Flight

ROCKET propulsion and interplanetary flight is to be the subject of a talk by Mr. A. V. Cleaver at the November meeting of the Aircraft Recognition Society, to be held in the library of the Royal Aeronautical Society, 4, Hamilton Place, London, W.1, on November 19th at 6.30 p.m. The meeting will be open, and visitors will be welcomed.

Mr. Cleaver is a member of the Council of the British Interplanetary Society.

Arctic Film

PHOTOGRAPHED in part from a flying boat, an interesting film of the arctic zone of Norway will be released in February by Gaumont-British Film Distributors. The cameraman responsible is Mr. Sydney Bonnett, who will be remembered for his work in photographing the flying expedition to Mount Everest in 1933. The film, which is a pictorial survey of Norway, starts at Stavanger, traverses Bergen and Oslo, moves northwards via Trondheim to Tromsö and onwards to Kirkenes.

The Chinook

ON display at the Canadian National Exhibition, held at Toronto this year, was a full-scale mock-up of the Avro Chinook, an axial-flow gas turbine manufactured by A. V. Roe Canada Ltd., and the first jet engine to be designed, developed and manufactured entirely within the borders of Canada.

Also displayed was a model of the Avro Canada C-102, a projected transport, for which orders have been placed for Rolls-Royce gas turbines. Reports from Canada state that the Chinook has six combustion chambers, a 9-stage axial-flow compressor and single-stage turbine. The diameter is 32in, length 125in, and weight 1,250lb. Thrust is given as 2,590lb.

Busy in India

DAKOTAS and Yorks of the R.A.F. have continued their "mercy" flights by carrying, at the request of the Indian and Pakistan Governments, refugees, personnel vital to public services and British families. Over 20,000 passengers were carried between August 15th and October 27th. The two transport squadrons of Dakotas loaned to the two Governments flew 5,926 hours and three Transport Command Yorks sent from England flew 294 hours, all aircraft flying between them a distance of over a million miles.

News in Brief

WE regret to record the death of Air Commodore Hugh Leedham, who held the post of Director of Radio Production at the M.A.P. from 1939-43, and later became Director of Radio Research. On retirement he was appointed Managing Director of Ericsson Telephones.

* * *

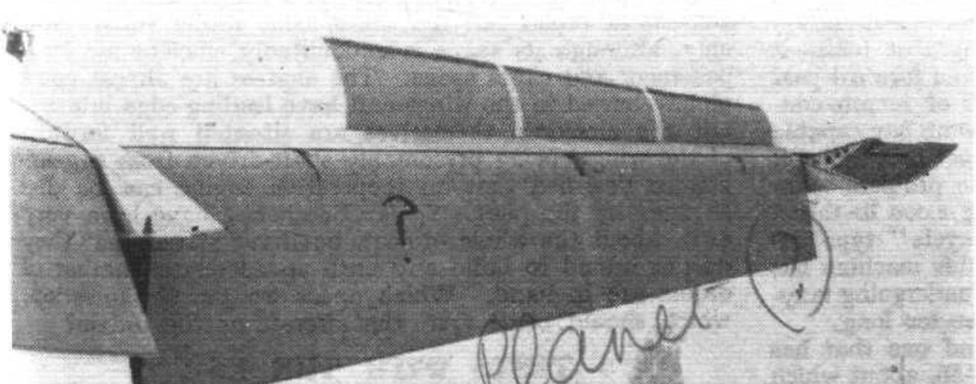
The possibilities of transpolar flying are being investigated in America, where military Superfortresses have flown more than 5,000 hours over the Arctic regions.

* * *

Ten passenger coaches were recently flown in a Bristol Freighter in a series of twice-daily flights from Melbourne to Launceston, Australia. On each trip one coach 22ft in length and weighing 6,000lb was carried, plus an additional 1,000lb of freight. Transport charges for each amounted to approximately £60.

* * *

A Viking of the Contract Charter Division of Airwork, Limited, recently flew Sir Robert Howe, K.C.M.G., to the Sudan to take up his new appointment as Governor-General. The trip was part of the Sudan Government Leave Service, which is run on an *ad hoc* basis for Sudan Government officials by Airwork, Limited.



AIR-BRAKING AND DRAG-TURNING: *The tri-motor Northrop N-23 Pioneer transport employs full-span flaps—the ailerons drooping for this duty—in addition to supplementary retractable surfaces above the ailerons which act as air-brake/spoilers. These can be used independently for drag-turning moment, or simultaneously for aerodynamic braking. The device is referred to in Capt. R. Lucien's lecture, which is reported on pages 554-556.*

American Newsletter

Progress of Jet Bombers and Fighters : The New Beechcraft Twin-Quad : Rocket-Propulsion Research

By "KIBITZER"

DETAILS and photographs of some new American aircraft, both civil and military, have appeared in the Press over here during the last week or two. Considering how reserved other nations are about new developments, the rather free-and-easy attitude of the Americans is often surprising, particularly in view of the incredible "war-talk" that goes on here in the less responsible sections of the Press and community. But the publicity departments of the manufacturers, and even the Public Relations sections of the Army and Navy, have their job to do, and must often be torn between security and publicity, a fact that seems, occasionally, to prove somewhat embarrassing to those who are responsible for the country's secrets!

Two cases in point are the releases, photographic and printed, of the Boeing XB-47 swept-back wing jet bomber, and photographs of the North American swept-back wing XP-86 fighter. The former, which has been mentioned before in this letter, is undoubtedly the most advanced machine of its type in the world. It is powered with six General Electric J.35 jet engines giving a total thrust of 24,000 lb. Four of the six power units are situated close to the fuselage but below and forward of the wing, being carried by forward-staggered and totally enclosed streamlined engine bearers—presumably so that they may be well away from the high-lift wing and help towards a better position of the c.g., which is always a difficulty on machines with swept-back wings. The other two units are farther out towards the wing tips, where their position will undoubtedly help to lessen the bending moments of the wing itself.

Range of the XB-47 is given as 2,000 miles (which must mean that the fuselage is almost entirely filled with fuel, the wing being too thin to be of much use as a tank), while the top speed is given as 630 m.p.h. at 30,000ft! The wing sweep-back is 45 deg. If the estimated speed is reached it will need all known aerodynamic aids for overcoming compressibility, as the designers say the machine will be capable of Mach numbers of the order of 0.95. Despite the large size of this aircraft—it has a span of 116ft and a fuselage length of 108ft—it carries only a crew of three in the pressurized forward part of the fuselage. The armament consists of remote-controlled fifty-calibre guns in the tail, and a bomb bay capable of taking a 20,000-lb bomb. In order to get over take-off troubles at full load—a not inconsiderable problem—provision is made for 18 JATO units, giving 1,000 lb thrust each. The undercarriage is of the "bicycle" type developed by Glenn Martin, and although this machine has not flown at the time of writing, it is now undergoing taxying trials and should get into the air before too long.

The other swept-back wing aircraft, and one that has already flown, is the North American XP-86, about which little has been said in print but of which a photograph has been published. It is known, however, that the Army are pinning great hopes on this aircraft as a possible future world's speed-record holder (for they are still striving to regain this title from the Navy—even, it is said, to the extent of grooming the Bell XS-1 rocket aircraft for the job). As this latter was designed for air-launching, this rumour should be treated with considerable reserve. The photograph of the XP-86, however, shows a modern-looking fighter of some 15,000 lb, with its wings, rather small tailplane and rudder all swept back in the neighbourhood of perhaps 35 deg to 45 deg. It has a central nose entry duct, but an interesting point about the entry and tailpipe orifices is that both are slightly lipped-over at the top, giving a slight "pen-nib" shape. So far as the entry is concerned, one does not know whether this "Parker Pen" look is due to a desire to avoid certain intake compressibility troubles, or to improve intake flow at high angles of incidence, but it is said that the lipped tail-pipe exit improves take-off thrust and helps to eliminate snaking at high speeds.

The civil aircraft of which a photo has been released (see *Flight*, October 16th) is the long-expected Beechcraft Model 34, a twin-screw four-engine, 20-passenger machine.

The XB-47 makes its debut. Features apparent here are the underslung jet units, "bicycle" undercarriage and built-in A.T.O. installation.

Fitted with four 375 h.p. Lycoming engines, coupled together in pairs driving a single airscrew on each wing, ranges of up to 1,400 miles at a cruising speed of 180 m.p.h. are claimed at very economical operational figures. It has the Bonanza-type butterfly tail, and wings with a certain amount of taper, but the cabin looks rather square and ugly, although its shape is undoubtedly efficient for both passenger and cargo space. The engines are almost completely buried in the wings and have leading-edge intakes, but the airscrews themselves are situated well forward of the wings, being presumably shaft-driven from a gearbox so designed that an inoperative engine can be disengaged by the pilot. So far Beechcraft have been very quiet about the whole project, but have stated that they do not intend to build any until an adequate number of orders are in hand. Which opens up the old question, which should come first, the aircraft or the orders?

TESTS WITH THE XS-1

SOME further details of the Bell XS-1 research aircraft have also been released, and although this machine was only designed in the first place as an intermediate step towards a real supersonic type—possibly the XS-2—the data on its construction and performance are interesting. Of quite conventional plan form, but designed for air launching, the XS-1 has a wing area of 130 sq ft, is 31ft long and has a span of 28ft. The wing loading when first launched, and with full fuel tanks, was expected to be 100 lb/sq ft; the all-up weight 13,034 lb, with a landing weight of 4,818 lb. A landing speed of 110 m.p.h. was expected, but increases in the rocket-unit weight unfortunately caused these figures to be exceeded. All-rocket propulsion was decided upon, as there was little likelihood of there being any jet engine available with sufficient thrust to give the speeds required. The motor assembly, built by Reaction Motors Inc., consists of four 1,500-lb rockets individually or collectively controllable by the pilot.

The idea of dropping the XS-1 from the converted bomb bay of a B-29 has already been mentioned in these letters, but it is interesting to note that hardly any snags developed during the tests, which is a point that lends emphasis to the practicality of large bombers carrying their own protective fighters. Some fourteen or fifteen test drops and purely "glide flights" were made before any rocket power application was attempted, and when launched from 27,000ft these glides took some twelve minutes or so to complete. So far as pressurization of the XS-1 was concerned, this was done from the mother aircraft, after the pilot had entered the cockpit (which he could do from the mother ship while in flight), when he could close and seal his own cockpit with an internal pressure of 3 lb above atmosphere, the subsequent pressure loss being so small that the cockpit would remain pressurized until the flight was completed.

Data on actual flying characteristics are still being withheld, but on the first flight a Mach number of 0.79 was reached. Rumour has it that, on subsequent tests, various aerodynamic troubles developed which have prevented this machine from reaching its design speeds, for it is known that quite severe aileron "buzz" was encountered, and that considerable modifications may have been introduced to cure this and other troubles. One's own guess is that sonic speeds may not be attempted with this aircraft at all, as the Bell Company themselves would probably decry any attempt to label this project as supersonic. It was, in fact, most unfortunate that the early publicity blurbs, and the usual irresponsibility of some sections of the Press, gave the impression that here was the first supersonic machine. It is much more likely that the Bell XS-2, a swept-back wing type, was already slated as the natural successor to the XS-1, and that the manufacturers themselves always realized that the whole scheme would have to be taken in logical steps, with the XS-1 as the first stepping-stone. The fact, however, that the original conception of the XS-1 occurred in December, 1944, does make this project a most interesting one, if only historically.

INCREDIBLE BUT TRUE

ANYTHING can happen in the United States. And it does! And lest anyone should think that the following saga is a Hollywood fairytale or a Texas tall-story, I can only say that there is an official Civil Aeronautics Board report on the whole affair. In any case, nobody could possibly think it up, and there are, moreover, some fifty-three people who will probably never forget it, although they would probably like to! It goes like this:

An early morning DC-4 flight of one of the most reputable and reliable of all the domestic airlines here was on its way to the West Coast with forty-eight passengers and a crew of five. Flying at some 8,000ft over the Western desert (it was not stated whether this height was indicated or above the ground), it suddenly started to climb, and continued to do so at an ever-increasing angle. It then dropped its nose violently, dived, bunted, was presumably completely inverted, was rolled out to the left at a height of under 1,000ft—and was flown back with its terrified occupants to the nearest airport and landed! Automatic pilot trouble, you think? Not a bit of it: apparently just a misplaced desire for knowledge.

There were on board three pilots, the normal scheduled captain, his second pilot, and another captain who was on a familiarization flight, and who was at the time in the first pilot's seat flying the machine, with the regular captain sitting behind him on the "jump-seat." Perhaps with the thought of a recent crash on his mind, but without saying anything to either of the pilots who were at the controls, this captain engaged the gust, or control, lock, presumably in order to see what would happen! Quite naturally this froze the controls solid and in such a position that the machine began an ever-increasing climb.

To counteract this, and ignorant of the fact that the controls were locked, the pilot who was flying began to wind the trim tab forward. Naturally, nothing happened (and, in fact, this would make matters worse, because to fly an aircraft with locked elevators by means of the trim tabs—and it has been done—the wheel must be wound in *reverse* way to that normally applied). So the pilot wound a bit more, at which time the regular captain, still without saying what he had done in the first place, took the gust lock off; the trim tabs naturally took complete control, and the aircraft dived and bunted! The only member of the cockpit crew who was strapped in was the second pilot, who kept in his seat, the other two being catapulted into the roof of the cockpit, where they hit three of the four feathering buttons and feathered three engines. The second pilot kept not only his seat, but his head, regained control of the aircraft, rolled it out to the left at a terrifyingly low height, and got everything working again—even the engines—in time to prevent a certainly fatal crash, a feat of not only considerable strength but magnificent pilotage.

Not having met anyone who was either party to or victim of this saga, I cannot give a description of what went on in either the cockpit or the cabin, but anyone who has any imagination at all should be able to think up enough detail to keep themselves awake at night for a week!

(P.S.—The pilot who applied the control lock is no longer with the company!)

BOOK REVIEW

The Other Battle. B. Donovan M. Ward. Issued by the Birmingham Small Arms Company, Small Heath, Birmingham.

THIS is the story—well told and beautifully illustrated—of a firm and its products. The firm is the Birmingham Small Arms Company, Limited, and its products, at least those which will prove of special interest to our readers, are guns for aircraft.

Armourers and pilots will need to be told little of the qualities of B.S.A.-built Browning guns, but they may be interested in the following anecdote.

On the adoption of the Browning gun by the Air Ministry the B.S.A. Company found that it was not being invited to tender for the manufacture of this weapon. Sir Geoffrey Burton visited the Air Ministry to discover the reason. Having explained the purpose of his call, he was told "You are in the cycle and motor cycle business. You are not machine gun manufacturers." Mildly Sir Geoffrey pointed out that his was the oldest armaments company in the country and that in the Great War it had manufactured every single Lewis gun used by the Navy, Army and R.A.F. This interview did lead the Air Ministry to reconsider the matter and the company was asked in June, 1935, to quote for the production of 1,050 guns at the rate of 50 a week.

To shorten the story it may be said that a round-table conference was necessitated on the question of interchangeability of parts and, during this, Mr. Leek, of B.S.A., stated that, since, in his opinion, a production rate of 2,000 guns a week would eventually be required, it was regrettable that output should not be planned from the start on those lines. The account goes on:

"The statement was received with laughing incredulity. "Perhaps," said the chairman, "Mr. Leek will tell us for what possible purpose 2,000 guns a week could be needed." "From what I have just seen on the Continent of the preparations for war there (Mr. Leek had just returned from Leipzig) we shall need them to defend ourselves against Germany." Again there was laughter. "The R.A.F. will not need 2,000 guns a week for the next 20 years," was the chairman's answer. In 1942 the Air Ministry was to demand 5,000 guns a week from B.S.A.

Engine-off Landings

First Thorough Examination of an Aspect of Helicopter Flight Hitherto Somewhat Neglected

"SOME work with Rotating-wing Aircraft" was the title of a lecture delivered to the Helicopter Association of Great Britain on October 25th by Mr. O. L. L. Fitzwilliams, B.A. The lecturer is helicopter engineer at Westland Aircraft, Ltd., where preparations are now being made for the production under licence of the Sikorsky S-51. He was, during the war, at the Airborne Forces Experimental Establishment at Beaulieu, and the first part of his lecture dealt with the fun and games they had there when a dismantled Focke-Achgelis Fa 330 rotating-wing glider arrived. With no instructions as to how it worked, they had to resort to theoretical estimates and logical reasoning before flying the kite from a trailer. Fortunately the estimates proved reasonably correct, and Mr. Robert Kronfeld was able to fly it successfully. In fact, it turned out to be quite docile.

Mr. Fitzwilliams also gave some interesting particulars of the Focke-Achgelis Fa 223 twin-rotor helicopter which was the first helicopter to cross the Channel (in September, 1944), piloted by its German crew.

Another section of the lecture dealt briefly with the activities of the Westland-Sikorsky S-51, and was followed by a film illustrating some of the points made in what was the main purpose of the Paper: landing a helicopter without using engine power. The film showed a Hoverfly I making engine-off landings at Beaulieu in 1945.

So far as we know, this subject has not previously been dealt with in published form other than very superficially, and as it is of great importance in the future development of helicopters, it deserves to be made available to the widest possible circle of readers. We understand that the lecture is to be published in full in the Journal of the Helicopter Association, and later there may be a discussion, for which there was no time on October 25th. Following is an almost verbatim report of this part of Mr. Fitzwilliams's lecture.

There is still a good deal of argument about engine-off landings, and in discussing them with all sorts of people I find a diversity of views and experience which is extraordinary, considering the length of time that helicopters have been in operation. The subject is made up of a number of very simple considerations which most people consider to be obvious, but, probably for this reason, nobody seems to have bothered to analyze them in detail or to set them out in a logical sequence.

Piloting Technique

Our present confusion arises partly because the requirements of an engine-off landing have not received adequate attention in the design of our first generation of helicopters, and partly because very few pilots have been trained *ab initio* on helicopters. Thus the early pilots have found that they can pull off forced landings in a helicopter with the aid of techniques previously learnt from the aeroplane and the Autogiro. These techniques are familiar, and their successful modification to suit the helicopter has enabled us to answer a lot of awkward questions about what happens when the engine stops, but when one watches the modern pupil being taught to practise engine-off landings by doing violent flare-outs or high-speed dives, followed by long floats over the ground, one cannot help thinking that an essential screw somewhere wants tightening.

In practice, these techniques work remarkably well, but they are nowhere near what is required before the helicopter can be considered suitable for large-scale use as a common means of personal transport. Also their familiarity and apparent naturalness have led to their limitations being accepted as inherent limitations of the helicopter, and it is now up to the designer to expose this fallacy by providing helicopters which, in the event of engine failure, can be landed as helicopters instead of as imitation aeroplanes or Autogiros.

Although opinion among designers may not be unanimous on this point, I believe the facts are sufficiently obvious to ensure an early improvement in the ease with which engine-off landings can be made, but in general it will take some time to produce new helicopters and to modify existing ones, to meet the new requirements. In the meantime, before our confusion gets worse confounded by current training programmes, I think there is a need to set out and examine the considerations governing the performance of an engine-off landing, so that we can at least have a common basis for discussion of our present practice, and a common understanding of the changes which may shortly be expected.

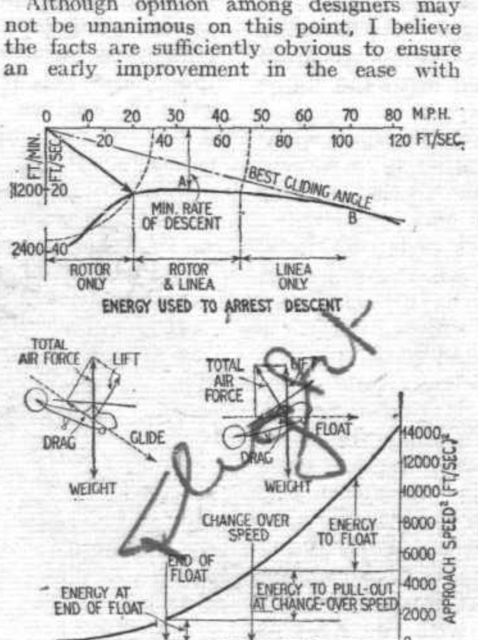


Fig. 1. The use of linear energy in engine-off landing of a Hoverfly I (Sikorsky R-4B).

To begin with, the most obvious thing about any method of performing an engine-off landing is that its primary purpose is to eliminate the downward velocity of the approach glide. Therefore, during some part of the landing manœuvre, the vertical component of the total air force acting on the aircraft must exceed the weight for long enough to allow the downward velocity to vanish.

During the approach glide the aircraft is in equilibrium at a constant speed so that the total air force acting on it is vertical and equal to the weight, and the energy required to produce this force is supplied by the potential energy which the aircraft is steadily losing by virtue of its descent. The supply of potential energy is, however, cut off at the same time as the descent is arrested, while the force required to do this is at the same time greater than that which was steadily maintained in the approach glide. The necessary considerable supply of energy must, therefore, be tapped from some other source, and in an engine-off landing the only other sources are the kinetic energy which the helicopter possesses by virtue of its speed along the glide path, and the kinetic energy stored in the rotors by virtue of their angular velocity. It therefore follows that, while the downward velocity of a helicopter is being arrested there will be a reduction of the speed along the flight path or of the angular velocity of the rotors or of both; these three ways of using the kinetic energy which is available correspond to the three types of possible engine-off landings.

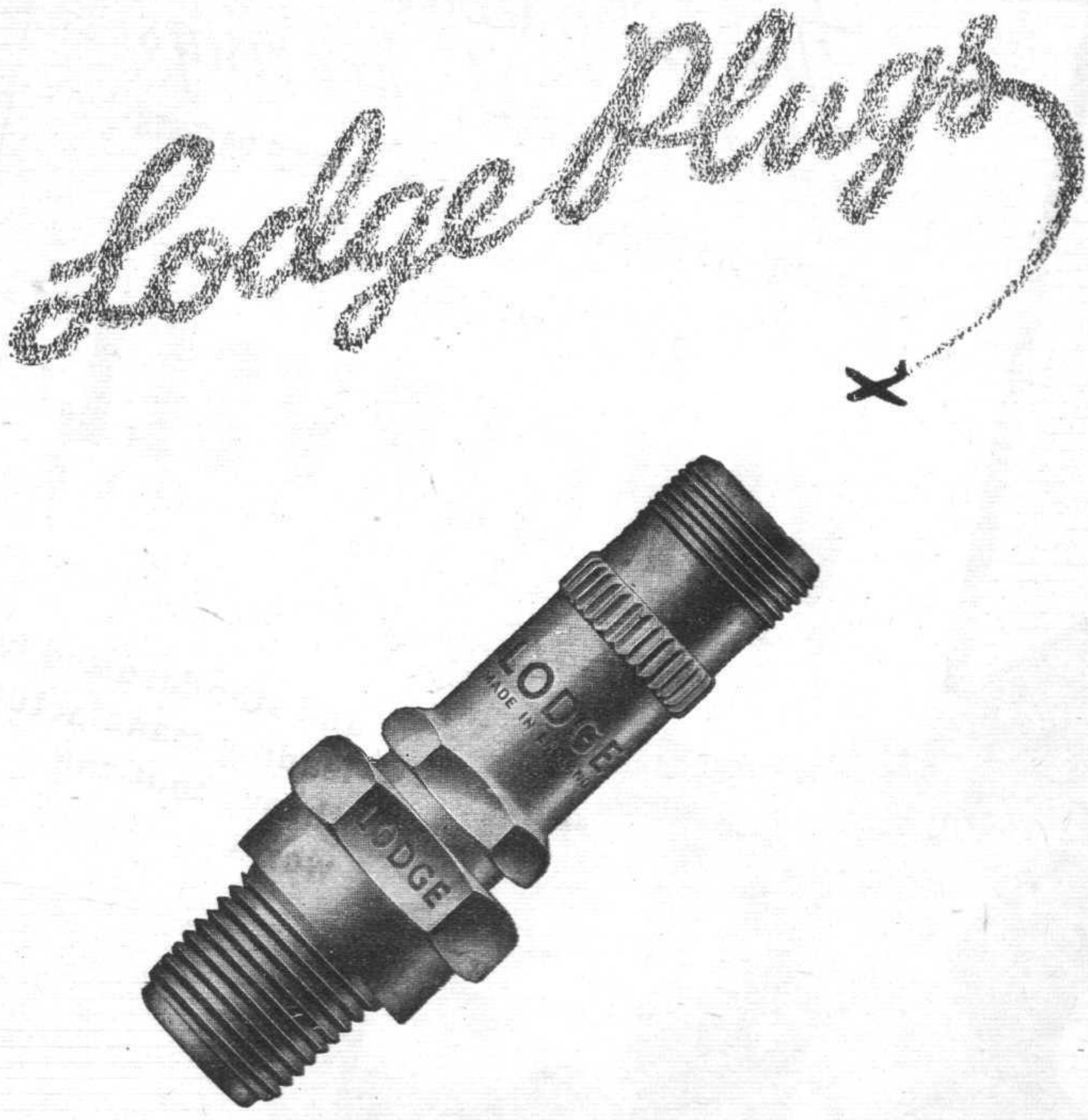
Employment of Kinetic Energy

The considerations which govern the manner in which the kinetic energy is used are illustrated in Fig. 1. This graph may look rather complicated at first, but I think it will be quite easily followed if we start with the thick arrow in the upper part of the graph, which is a polar diagram. The thick arrow represents the motion of a helicopter in steady flight because its length indicates the speed of the helicopter and its downward inclination is the actual slope of the glide path since you will notice that the horizontal and vertical scales inside the border of the diagram are marked off identically in ft/sec.

The arrow rests on a curve which represents approximately the glide performance of the Hoverfly I (Sikorsky R-4B) helicopter, and you will notice that if the tip of the arrow were moved from left to right along the curve, the length of the arrow would increase and its inclination would get less until we arrive at the point A, where the arrow would indicate the gliding angle and flight path speed corresponding to the minimum rate of descent. After this the arrow would get rapidly longer for small changes in the gliding angle, until at B it would become tangent to the curve and would then indicate the flight path speed for best gliding angle, which occurs near the top of the speed range for the Hoverfly I.

Now if it is desired to eliminate the downward velocity of the approach glide by means of the kinetic energy of forward motion alone, the helicopter must be brought in at a fast glide, and the rotor incidence must then be increased beyond the amount which is correct for steady flight. The rotor will then produce an excess thrust, and the aircraft will commence to do a normal pull-out. Also the speed of the aircraft will fall during the pull-out, and the rotor incidence relative to the flight path will have to be continually increased so that for each speed it is always more than the amount which would be correct for steady flight. In this way the kinetic energy of forward motion is exchanged for the temporary excess thrust required to perform a pull-out. The result is that, in general, the downward velocity has been eliminated at the expense of forward speed.

If we consider a helicopter which is gliding fast so that the arrow tip is resting on B, then if the rotor incidence is increased by a small amount and the aircraft is subsequently allowed to settle down in steady flight, it will do so in a condition indicated by an arrow resting on some such point as A, and the arrow will then be much shorter than before, indicating that a small increase of rotor incidence corresponds to a considerable loss of speed in steady flight



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Engine-off Landings . . . . .

and to a much more considerable loss of kinetic energy, since the initial speed was high and the kinetic energy is a function of the square of the speed.

So long as a small increase in rotor incidence corresponds to a substantial loss of kinetic energy, a pull-out can at least be started; but consider the thick arrow in its present position: Here even a large increase in incidence corresponds to only a small change in speed and a negligible change in kinetic energy, since the initial speed is low. Even if the rotor were suddenly tipped up at right angles to the flight path, all that would happen would be that the arrow would swing down to indicate vertical descent and then it would be too short to reach the curve until the helicopter had settled down to a steady flight in the new condition.

To measure the length of the arrow in this diagram it is necessary to swing it on to one or other of the scales. If it is swung up to the top scale it can be seen that its length in the position shown corresponds to a glide approach at an indicated airspeed of 25 m.p.h. in the Hoverfly I, and it is clear that in these conditions the kinetic energy of forward motion is, for practical purposes, exhausted so that no sort of pull-out is possible from an approach glide at or below this speed. In fact, for the Hoverfly I there is no condition of steady gliding flight corresponding to an airspeed of less than about 23 m.p.h., although this is not indicated by an ordinary A.S.I. because the pitot tube is usually horizontal so that it does not register flight path speeds in steep descents.

In engine-off landings from approach glides as steep as that indicated by the arrow, the elimination of downward velocity is entirely dependent on the use of the collective pitch control as a means of extracting energy from the rotor to provide the required vertical force, and none of the helicopters in common use to-day is suitable for landing gently at zero ground speed in still air from an approach glide of this kind.

As the speed of the approach glide is increased above the minimum airspeed, it again becomes possible to commence a pull-out, but a considerable amount of energy is required to complete this manœuvre and, in the case of the Hoverfly I, a simple pull-out cannot be completed until the speed of the approach glide has risen to somewhere between 45 and 50 m.p.h. I.A.S. Above this speed the collective pitch control can no longer conveniently be used to assist in arresting downward velocity in an actual landing, and for this reason I will refer to the approach speed at which a simple pull-out is just possible, as the change-over speed.

Glide and Float Differences

Above the change-over speed a horizontal float becomes possible after the pull-out. The minimum speed at the end of an ordinary float occurs when the kinetic energy of the forward motion is exhausted, and it is basically the same speed as that represented by the length of the thick arrow. There is, however, a difference between conditions in a glide and those in a horizontal float. This is illustrated by the small diagrams in the centre of the graph, which show that whereas, in a glide, the total air force is vertical and equal to the weight, in a float it is the lift which is vertical and equal to the weight. Since the disposition of the forces is otherwise identical, it follows that they are slightly bigger in a float for the same rotor incidence, and the corresponding speed is approximately 10 per cent higher, so that for the Hoverfly I the minimum speed at the end of an ordinary float is about 28 m.p.h.

The lower half of the graph merely summarizes part of what we have seen in considering the top half. We have already noted that the kinetic energy of forward or linear motion depends on the square of the speed, and the lower curve shows how the initial energy of the approach glide increases with speed. It also indicates roughly the energy required for the pull-out and the rapid manner in which the energy available for the float increases with the speed of the approach glide.

In an emergency the collective pitch control is sometimes used at the commencement of an engine-off landing, but our practice of engine-off landings is still almost entirely based on the azimuth stick as the instrument for eliminating downward velocity. Therefore, if we consider only engine-off landings corresponding to engine failure at a sufficient height to allow the pilot full choice of his approach, I think I will not be treading on too many toes if I regard the flare-out as a special kind of pull-out and say that our present practice is based on the motions of pull-out, horizontal float, and final sit-down with the aid of the collective pitch control.

In engine-off landings of the kinds usually practised, the float is sometimes absent and so, occasionally, is the use of the collective pitch control. Also the collective pitch control is sometimes used to cushion the fall of the helicopter after a flare-out some distance above the ground, and sometimes merely to hold it in the air while it continues to lose forward speed after the end of a normal float. But before we consider these motions in detail I must first clear

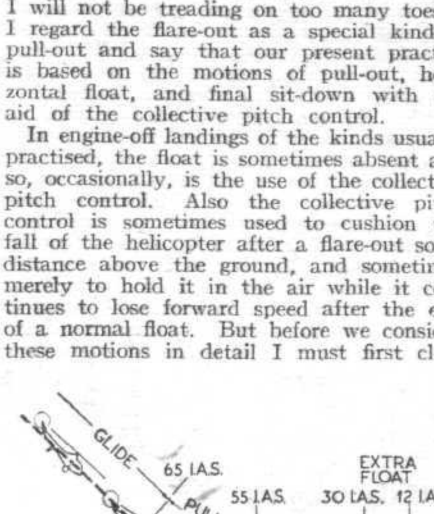

Fig. 2. Engine-off landing from high-speed approach glide. The lower curve shows ballooning due to sharp pull-out. (Hoverfly I).

up a statement which I made earlier and which is repeated in Fig. 1, to the effect that the collective pitch control cannot conveniently be used to assist in arresting downward velocity above the change-over speed.

At first sight this seems to be rather odd, because the collective pitch control is at all times a powerful means of arresting downward velocity, and whereas it is the only means of doing this from glides at the minimum airspeed, its effectiveness is also very considerably increased in forward flight. In fact, even if a fully loaded Hoverfly I is put into a glide at any A.S.I. reading between, say, 35 and 70 m.p.h., the altimeter hand, which rotates quite fast in a steady glide, can easily be stopped momentarily by pulling up the pitch lever, even if the speed is kept constant and the throttle shut. At an A.S.I. reading of between 40 to 60 m.p.h. the altimeter hand can not only be stopped, but it can be held stationary for a brief period during which the machine is flying horizontally without power at more or less the original forward speed.

On the other hand, if an attempt is made to eliminate downward velocity by means of the collective pitch control in a landing from an approach glide at more than the change-over speed, the pilot will find himself in a dilemma because the only way in which he can reduce his ground speed is by tilting the helicopter backwards. If he starts to do this before using the collective pitch control, the result will be an ordinary pull-out or flare-out. If he pulls back the azimuth stick at the same time as he uses the pitch lever, he will find the helicopter doing an excessively hard pull-out, with the result that his last ground speed will be considerably greater than his first and he will have to down pitch and quickly think of some other manœuvre. Finally, if the pitch lever is used first from a glide above the change-over speed, the velocity of the helicopter cannot subsequently be reduced to less than the minimum steady airspeed, so that the forward component of this velocity can be appreciably reduced only at the expense of a heavy landing.

Landings to be Practised

We can now examine the kinds of engine-off landing which can be practised with the helicopters at present in common use, and in this connection I have in mind particularly the Hoverfly I, which is a very good machine for this kind of practice, since it gives the pilot manual control over the collective blade pitch, which I believe to be essential, and it is also so arranged that the main rotor can be safely inclined backward at quite large angles, even when the tail-wheel is touching the ground. Also at this point I must remark that, because a landing is a manœuvre which is, by definition, conducted close to the ground and is always seen in relation to the ground, the effect of the wind speed on its appearance causes such confusion in the arguments which usually follow that it is absolutely essential to base our discussion strictly on no-wind conditions.

The upper part of Fig. 2 shows the essential attitudes and motions of an engine-off landing from a high-speed approach. The speed figures quoted are subject to considerable variation, but they are, in fact, typical of one kind of landing which has been extensively practised at Beaulieu, where, in initial tests and in subsequent training and practice, well over 200, and probably by now nearer 300, of these landings have been made without mishap. I think this landing is ideal for initial training purposes because it is divided into a number of separate and distinct movements in which mistakes are easily noticed for correction in subsequent practice. It is useful for any ordinary forced landing in open country, and it can also be modified to suit many special circumstances. In this landing the collective pitch control is used only in the "extra float," and the manœuvre comprises a fairly fast approach glide, a gentle pull-out, and a horizontal float, so that it is very similar to an aeroplane landing. The feature which distinguishes it from other engine-off landings practised by rotating-wing aircraft is the deliberate inclusion of the horizontal float after the completion of the pull-out.

The float is typically entered at a fairly high forward speed, with the fuselage substantially horizontal, and we have already seen that conditions at this point are governed almost entirely by the speed which the pilot chooses for the approach glide. Thus the conditions of entry into the float are voluntary, but so long as the float remains level the subsequent deceleration of the aircraft, and the corresponding adjustment of its attitude, are governed exclusively by its aerodynamic characteristics and are therefore involuntary; with the important exception that the pilot can at any time discontinue the float, either by allowing the aircraft to settle on to the ground or by using the collective pitch control to hold it in the air while it continues to decelerate without further alteration in attitude.

The rate at which the rotor incidence, and the attitude of the fuselage, increase during a float is of particular interest in connection with the landing of helicopters in which a large backward inclination of the fuselage is not permissible near the ground because of the possibility of fouling the tail rotor. The incidence of the rotor varies inversely with the square of the speed, so that the change in rotor incidence for a given reduction in speed is small when the

Engine-off Landings . . . . .

speed is high, but becomes quite large at low speeds. Also the deceleration of the aircraft, as a fraction of g, is simply the inverse of its lift/drag ratio, which is the same as the gliding angle. The gliding angle of the Hoverfly I varies from about 1 in 4 at 70 m.p.h. down to 1 in 2 at 30 m.p.h., so that if it is brought in fast, its initial deceleration is about one-fourth of 1g, which is quite small, but the deceleration will increase to approximately a half of 1g at the end of the float, and the speed will then drop off rapidly.

A simple calculation indicates that a float between the speeds indicated in Fig. 2 would last little more than three seconds, in which time the helicopter would travel about 200 feet. Owing to the improved lift/drag ratio at high speeds, the speed lost in the pull-out is less from a fast glide than from a slow one, so that if a Hoverfly I is brought in at 75 m.p.h. it will still be doing about 70 m.p.h. when it enters the float, which will then last about six seconds and be about 450 feet long.

Six seconds does not sound very long, but you will see from the film that it is much longer than is needed to correct even gross errors in the height of the pull-out. During most of this time, the rotor incidence changes very slowly, so that the pilot has no difficulty in judging when the inclination of the fuselage has gone far enough.

So long as the approach glide is fast, the attitudes and motions of the helicopter remain as shown in the top part of Fig. 2, where the extra float is voluntary and the length of the ordinary float can be varied at will by altering the speed of the approach glide. But when the speed of the approach glide is reduced below about 65 m.p.h., in the case of the Hoverfly I, the character of the landing begins to alter, and we find that as the ordinary float disappears the extra float becomes a necessity for correcting errors in the height of the pull-out. Also, the rapid changes in fuselage attitude, which before occurred only at the extreme end of the float, now begin to appear at the end of the pull-out, and the nature of the pull-out itself begins to be affected to an increasing degree by the inertia characteristics of the rotor, which give rise to a surging or flaring of the rotor speed, so that we shall have to examine this phenomenon before considering the performance of landings from low-speed approaches.

Fortunately we can understand the flaring of rotors without becoming involved in lengthy arguments about autorotation, for it is a well-known characteristic of a rotor which is autorotating at constant pitch that it has a particular speed of rotation when carrying a particular load, and this rotor speed is substantially independent of the forward speed of the aircraft. Also, if the load on the rotor is increased, as in a steep turn, the rotor speed will increase and, similarly, when the extra load is removed the rotor speed will fall again to its original value.

Increased Incidence Effect on Pull-out

But we have already noticed that, at a given forward speed of the aircraft, there is a particular amount of lift which may be expected from the rotor when it is at a particular angle of incidence under steady conditions. Also, except at very large angles, when the angle of incidence is increased, the lift of the rotor will increase, so that, if the aircraft happens to be doing a fast glide approach, when the pilot increases the rotor incidence the resulting increase in lift will cause the aircraft to start doing a pull-out.

Provided the approach glide is fast and the rotor incidence increased gently, the resulting pull-out resembles that of an aeroplane sufficiently closely to require no special comment, but if a sharp pull-out is attempted, the picture immediately changes, and the lower part of Fig. 2 is an attempt to illustrate what happens.

In a sharp pull-out the incidence of the rotor is rapidly increased to a large value, which would correspond to a high lift in steady conditions. But if we suppose the rotor incidence to be instantaneously increased, it is obvious that the rotor speed could not increase in a similarly instantaneous manner, although it might grow very rapidly, and the expected large increase in lift does not fully develop until the rotor speed has achieved an appropriately high value. Therefore, at the beginning of a sharp pull-out, the aircraft, in spite of its tail-down attitude, has a tendency to continue its original flight path while the rotor accelerates. This tendency can be seen by comparing the dotted flight path with the continuous line which represents the pull-out which would be done by a helicopter in which the collective pitch control is used to prevent the rotor from accelerating and thus absorbing energy.

When the rotor speed has flared up to something like the value appropriate to the expected increase in lift, the resulting pull-out may be very sharp indeed, but when the downward velocity is eliminated the pilot will immediately want to reduce the rotor incidence in order to enter smoothly into the float. By this time, however, the rotor will have achieved a high rate of rotation, and until it has slowed down again it will continue to deliver an excessive thrust, so that in practice it is almost impossible

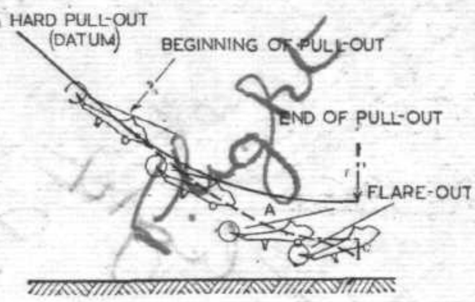

Fig. 3. Normal and flare-out landing from slow glide of Hoverfly I.

for the pilot to prevent the aircraft from ballooning.

The lower part of Fig. 2 shows the typical motion of a helicopter when a sharp pull-out is done from a high-speed approach. (Note.—This diagram is over-simplified because the fuselage is drawn parallel to the rotor in each case.)

So long as the pull-out is gentle, the tendency for the rotor to flare is a function of the speed of the approach glide. If the glide is fast, the rotor is at a very small incidence, so that its thrust is nearly perpendicular to the flight path and very nearly equal to the lift. The small increase in lift required for the pull-out is then produced by correspondingly small increases in the thrust and speed of the rotor. But at low speeds the rotor thrust is inclined backwards at a large angle relative to the flight path, so that a small increase in the lift, which is perpendicular to the flight path, can only be produced by a large increase in rotor thrust, which is accompanied by a correspondingly large increase in the speed of the rotor. On the other hand, in a very slow glide, near the minimum steady airspeed, the rotor incidence is already so large that to increase it further produces only negligible increases in rotor thrust and speed. Hence there is an intermediate range of approach speeds for which the tendency for the rotor to flare is a maximum.

The upper useful limit of this range occurs slightly above the change-over speed, say 50 m.p.h. for the Hoverfly I. The ordinary float is then negligible, and the rotor revs at the beginning of the extra float, though past their peak, are still high enough for the forward speed to be easily reduced to practically zero. At higher approach speeds the surplus rotor revs obtained in the flare are damped out before the extra float is commenced.

The pull-out from a glide at the change-over speed should end up with the aircraft at the attitude and speed, say 30 m.p.h., appropriate to the end of a float and with its rotor revs flared up to their peak value. If a pull-out of this kind is found to be too low, it can be tightened with the collective pitch control without altering the attitude of the fuselage, but in general it would be aimed to finish slightly high to allow a reasonable margin for error, so that the extra float which immediately follows would be slanting downwards.

In pull-outs below the change-over speed, level flight can be achieved but at much lower forward speed, so that practically no energy is supplied to the rotor in the last part of the manœuvre. A feature of these pull-outs is, therefore, that the peak rotor revs, occur before the end of the pull-out and are largely dissipated by the time it is completed. The classic example of this is the flare-out shown in Fig. 3, in which the motion of the aircraft is, ideally at any rate, completely arrested at the end of the manœuvre because the rotor, having achieved its peak revs, continues to develop sufficient excess thrust for height to be maintained while the remaining forward speed is eliminated. During this brief period the rotor is required to produce a large thrust at substantially zero speed, so that it decelerates very rapidly.

Avoiding Ballooning

A feature of a flare-out in which the speed is substantially eliminated without ballooning is that the last part of the manœuvre is roughly level. In Fig. 3 I think the curvature of the flight path is shown in a reasonably correct manner, and it will be noticed that the greatest curvature, and therefore the peak rotor thrust and speed, occurs at the position occupied by the letter A, where the fuselage attitude is still reasonable. Also the position of the point A is not very critical, as far as the rotor revs are concerned, because, although these fall off rapidly after reaching their peak, they are built up fairly steadily, as indicated by the slowly increasing curvature of the initial part of the pull-out. Therefore, if the fuselage inclination is not allowed to increase beyond the desirable landing attitude, the pull-out will finish at A and the slanting extra float can be commenced immediately while the rotor revs are at roughly their peak value.

In the Hoverfly I landings of this kind can be done from glide speeds as low as 40 m.p.h., and if the conditions at the point A are compared with those at the end of a float, they will be found to be much the same. So long as the flight path is curved upwards, the rotor thrust and revs will be greater than at the end of a float, but this excess thrust will temporarily remain after the flight path curves downwards and will largely compensate for the remaining downward velocity which is, in any case, not more than 10 ft/sec, or about 7 m.p.h., even if only half the original downward velocity is eliminated. The forward speed is approximately the same as at the end of an ordinary float, and so is the fuselage attitude.

The slanting extra float is, therefore, much the same as in landings from higher approach speeds. In short, this has the appearance of an easy landing, and this was also the opinion of Lt. Hosegood, who did the only one of which I have any direct experience. I have been a passenger in many engine-off landings, including a number (with S/Ldr. Cable) from approach glides at 50 m.p.h. in the Hoverfly I, but this is certainly the easiest I have seen yet as well as the most efficient for setting the helicopter down exactly where it is wanted. I believe this landing is often demonstrated by the Bell 47.

In future helicopters, the kinetic energy stored in the rotors will be about twice what it is to-day, and an engine-off landing of this kind at zero ground speed will be so simple that I hope it will become the normal landing of a helicopter except in very special circumstances.

(To be continued next week)

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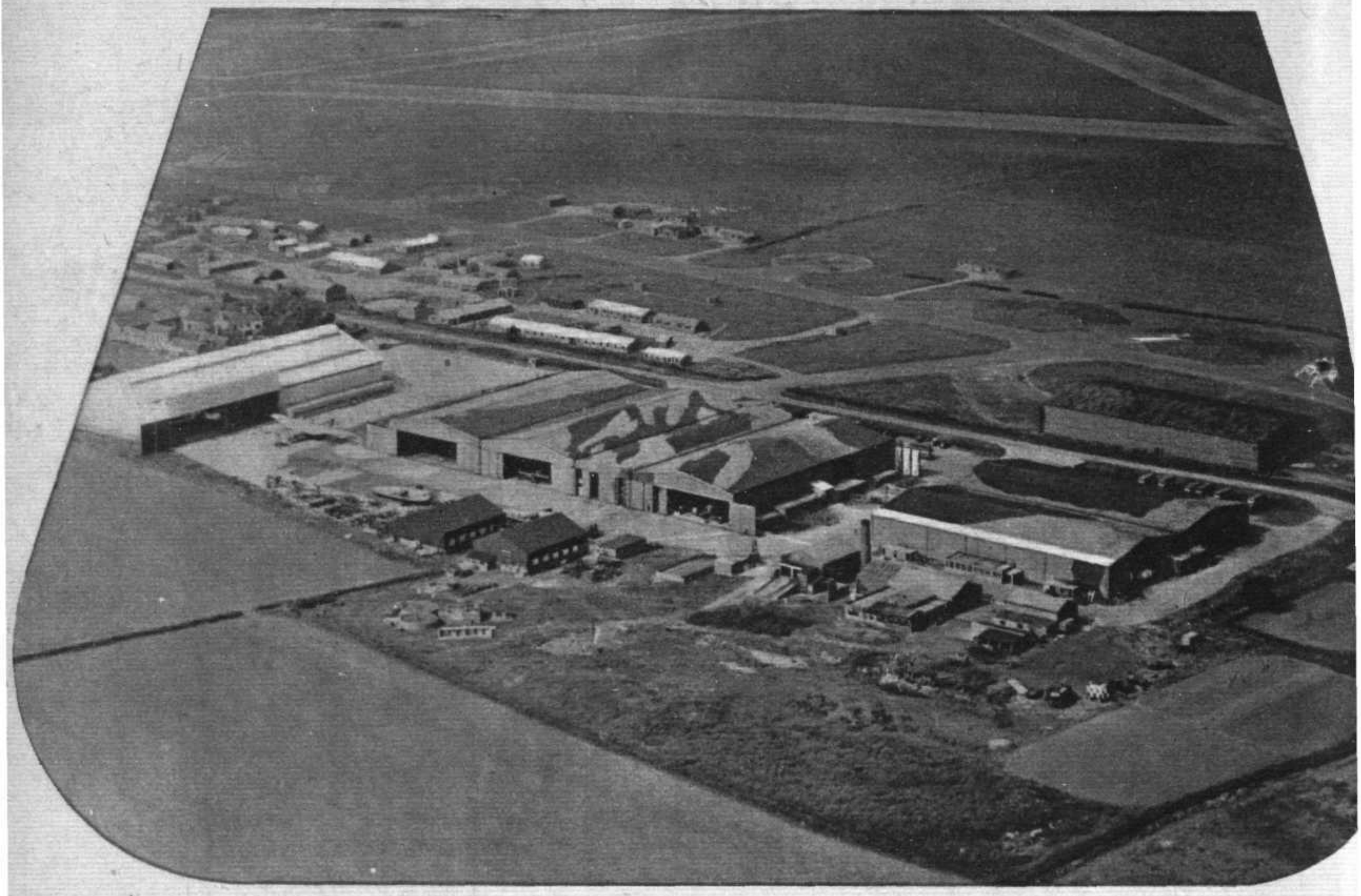

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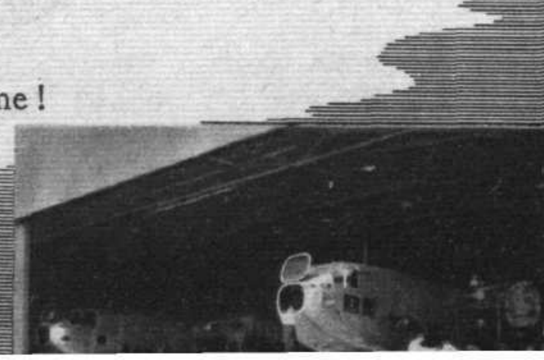

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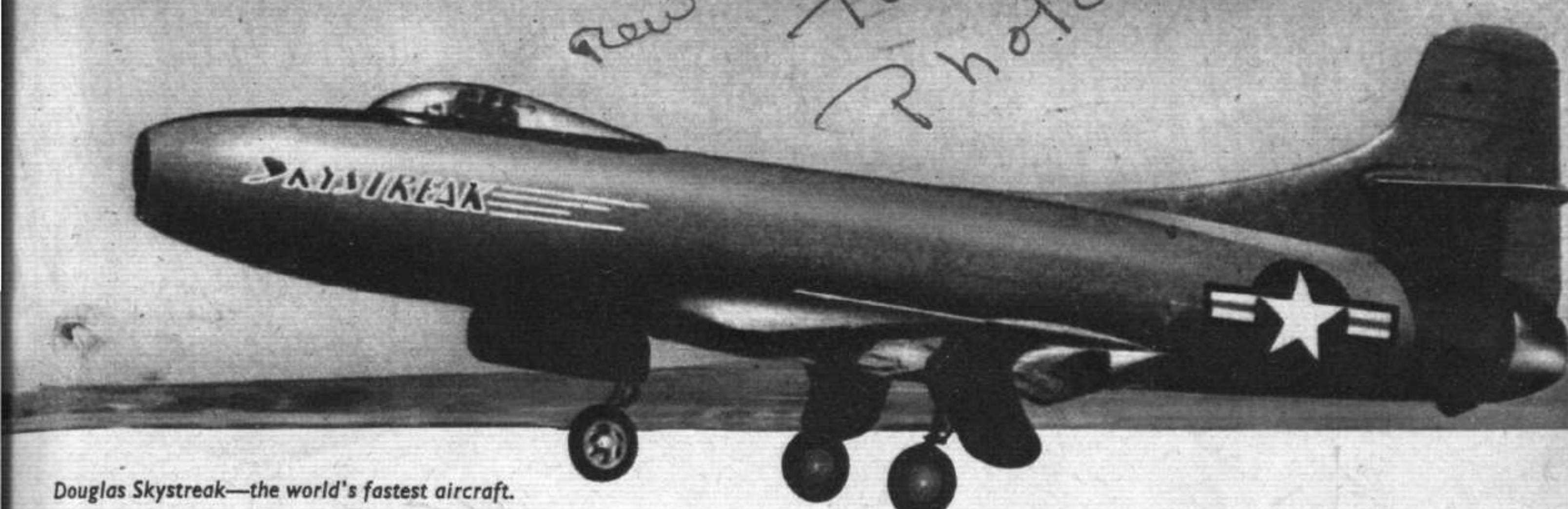
AMERICA'S JETS



Douglas Skystreak—the world's fastest aircraft.

Diverse Military Applications : Two, Four, Six and Eight-Jet Bombers

VALUABLE though it undoubtedly is, the world's air speed record, held by the American pilot of a Douglas Skystreak research aircraft, is less significant technically than are the numerous turbine-powered prototype aircraft which have been unveiled during recent months in the U.S.A. Possession of these machines means that America will gain flying experience with various power-plant layouts and combinations in aircraft ranging in size from small single-jet fighters to large six- and eight-jet bombers. Urgent problems concerning the operation of high-speed military aircraft, notably the large jet-propelled bomber types, may now be studied in practice.

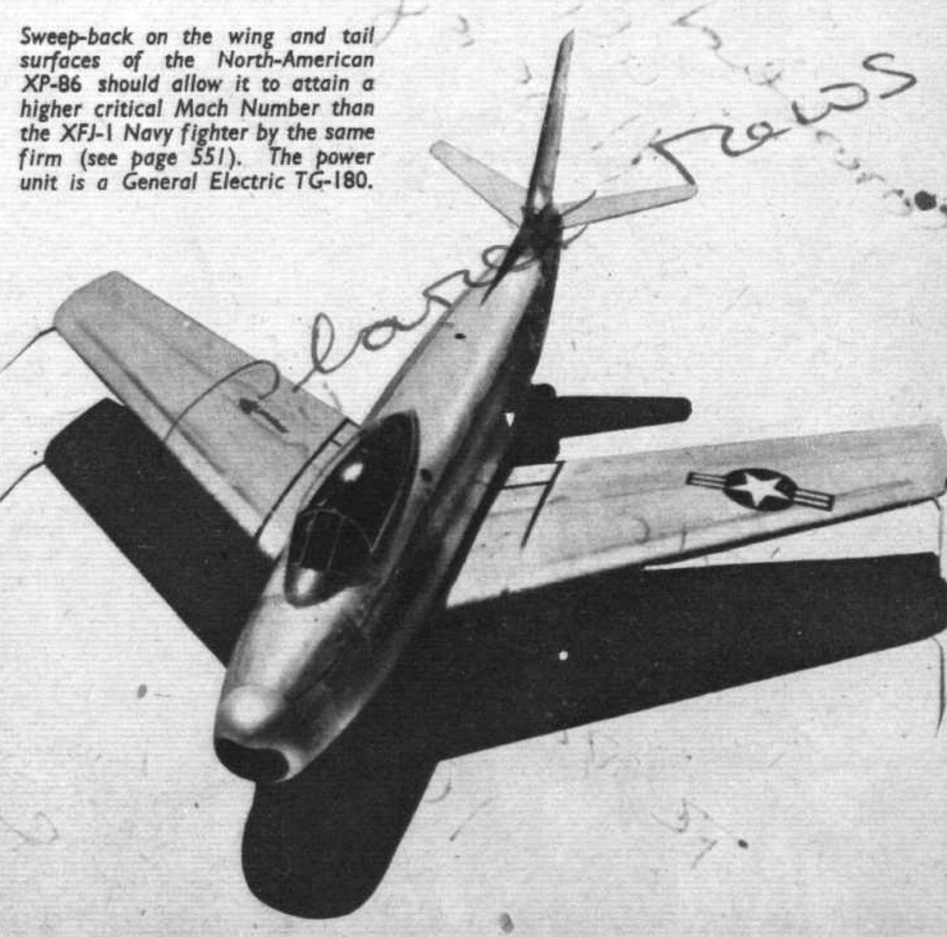
To a large extent this undeniable American advantage is offset by the recognized superiority of Britain's comprehensive range of turbine power units. The installation of Pratt and Whitney-built Rolls-Royce Nenes in American airframes is in progress, and a Nene-powered Grumman fighter —the XF9F2—should soon take the air. Unfortunately, a photograph of this type, which will probably correspond to our own Hawker N. 7/46, is not yet available to supplement the views of recent turbine-powered aircraft presented on these pages.

Whereas the American Army is now concentrating on pure-jet aircraft (though it has experimented with the Consolidated Vultee XP-81, having one airscrew turbine and one turbo-jet), the Navy is seriously interested in "mixed" power units, and three examples of aircraft so powered are illustrated. Unlike our own "flying test beds," with piston engines and turbine units, these American machines were designed with specific operational roles in view. Standard piston-engined aircraft adapted for the flight-testing of turbine units are less known than the British Lancasters and Lincolns which have been modified to take the A.S.X., Nene, Ghost, Theseus, Dart, Mamba and Python, but several test installations have been made in America. In particular, the Boeing B-29 (Superfortress) and Douglas A-26 (Invader) airframes have rendered valuable service as "test beds."

So far as is known, no rocket-propelled military aircraft has yet been flown in America, but rocket experience is being acquired with the Bell XS-1 transonic research aircraft. Mention has been made of rocket-assisted turbo-jet interceptors, including the Lockheed XP-90, and the design of pure-rocket fighters has been studied in detail.

Not the smallest of the problems attending the development of jet-propelled military aircraft is that of armament. Unorthodox gun installations are being studied, but it will be gathered from these pages that for the present the 0.5in Colt (Browning) gun continues in popularity, a typical fighter armament being six guns of this type. Some jet bombers will have barbettes, likewise with 0.5in guns.

Sweep-back on the wing and tail surfaces of the North-American XP-86 should allow it to attain a higher critical Mach Number than the XFJ-1 Navy fighter by the same firm (see page 551). The power unit is a General Electric TG-180.



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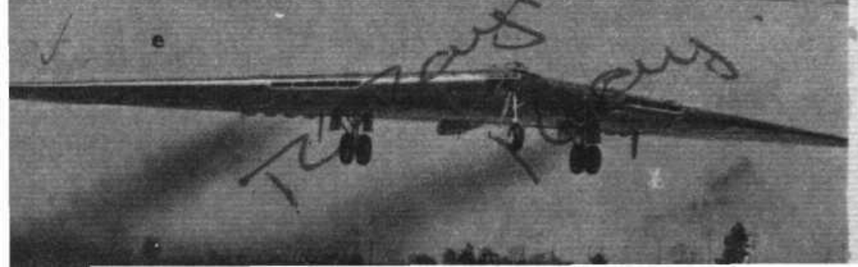
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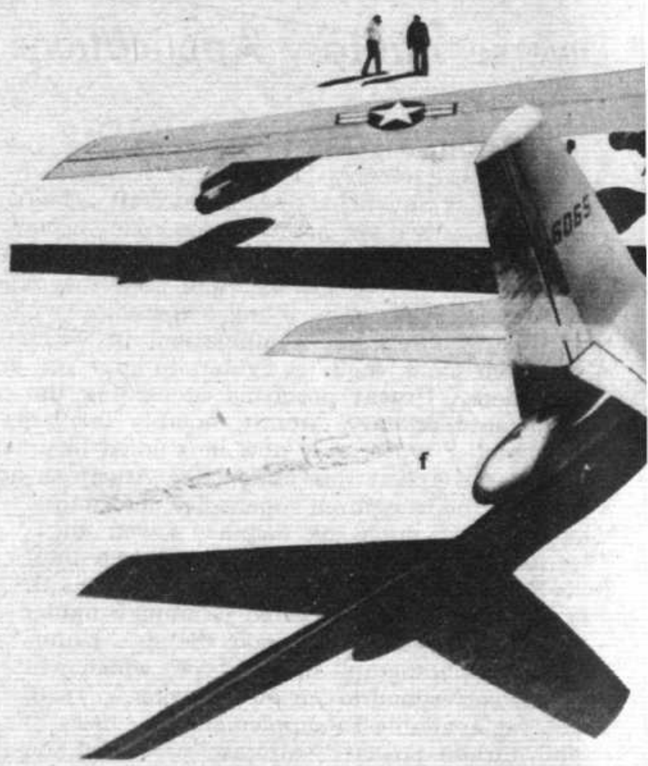
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BOMBERS

a *Clustered jet units and a tandem double-wheel main undercarriage, with outrigger stabilizing wheels, characterizes the Martin XB-48.*

b *Twin TG-180 axial-flow turbo jets are mounted side-by-side in the fuselage of the Douglas XB-43 light bomber. In the XB-42 the same positions were occupied by Allison piston engines.*

c *Probably the most graceful aircraft yet built, the Consolidated-Vultee XB-46 has four TG-180s, the installation of which should be compared with that in the North American XB-45 (below).*

d *In common with other types of American jet bombers the North-American XB-45 has a fighter-type "bubble" cockpit canopy.*

e *The basic airframe of Northrop's eight-jet YB-49 "flying wing" bomber is identical with that of the piston-engined XB-35.*

f *Rarely have so many novel design features been incorporated in a prototype as are evident in the Boeing XB-47 Stratojet (six TG-180s)*

AMERICA'S JETS . . .

FIGHTERS

g *"Pirate" is the name chosen for the Chance-Vought XF6U-1 fighter for the U.S. Navy. The power plant is an axial-flow Westinghouse and the armament six 0.5in guns grouped in the nose.*

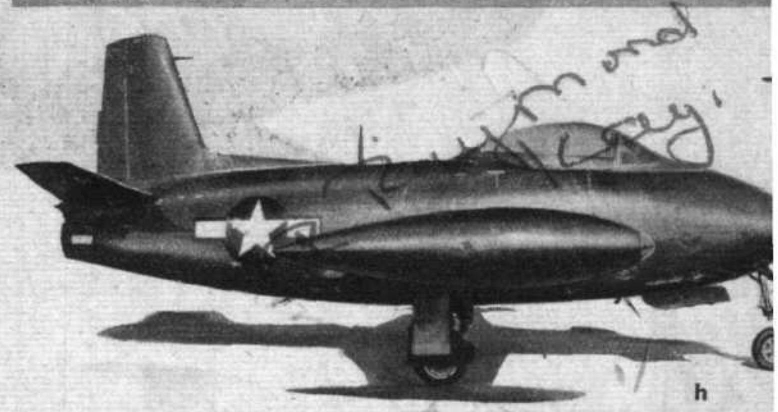
h *North-American's first jet fighter is the XFJ-1, for the U.S. Navy. Note the wing-tip auxiliary tanks, strongly favoured in America.*

i *Larger and more powerful than its precursor the Phantom, the McDonnell Banshee (XF2D-1) Navy fighter has inboard-mounted Westinghouse turbo jets. Four 20 mm. guns may be fitted.*

j *The Lockheed P-80 Shooting Star depicted is the "R" variant which held the world's speed record at 623.8 m.p.h. until this performance was bettered by the Douglas Skystreak.*

k *A total of 550 of these Republic P-84 Thunderjets is on order for the U.S. Army. Six 0.5in guns are mounted in the present model.*

g



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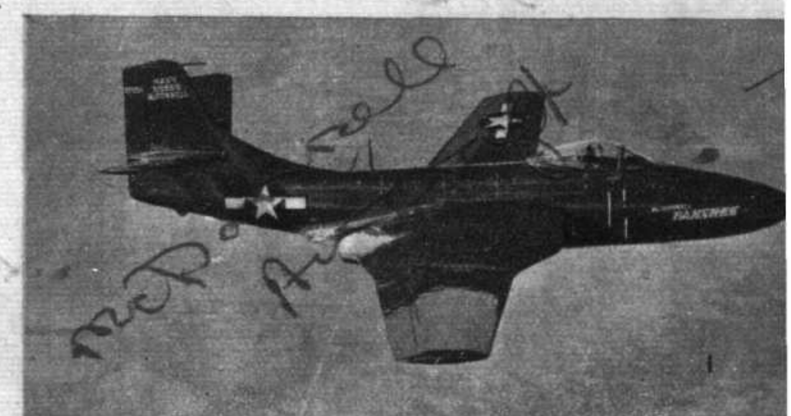

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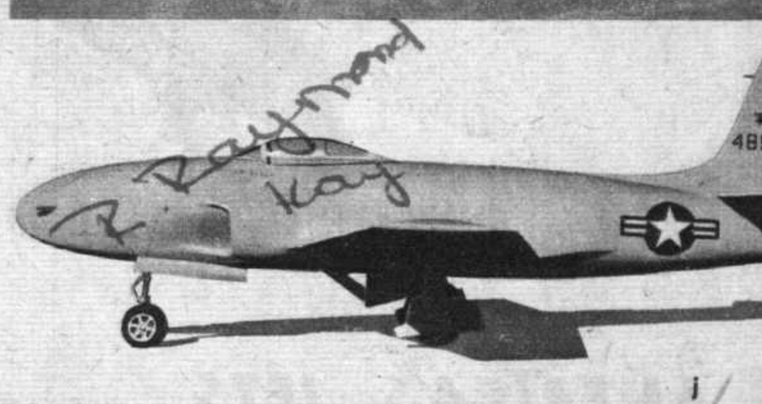

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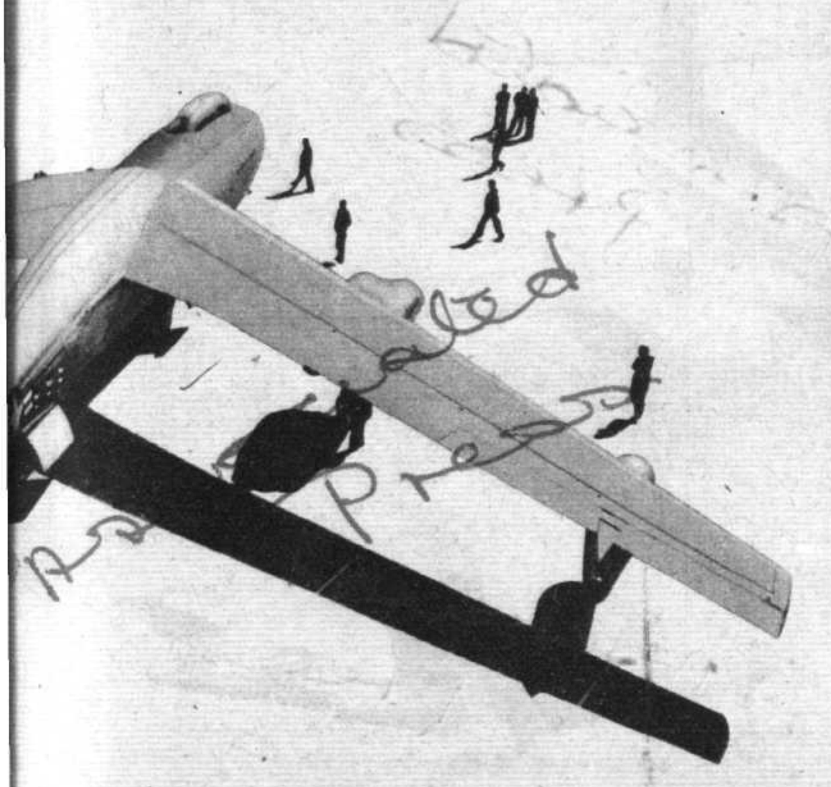

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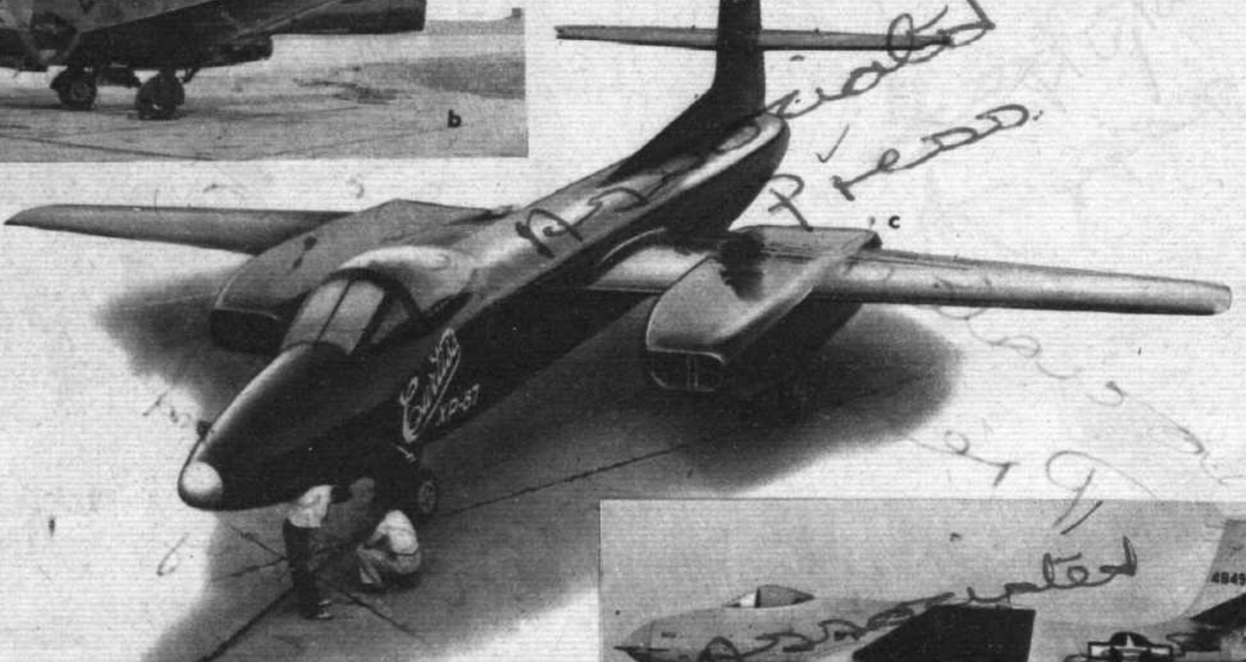

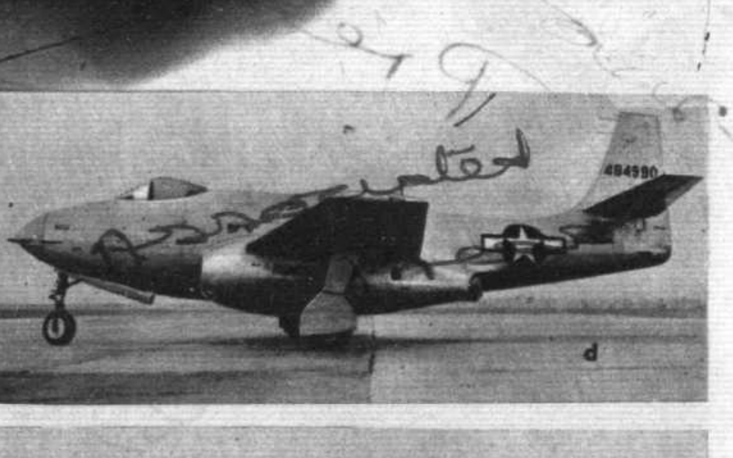

AMERICA'S JETS . . .

MIXED POWER PLANTS

a *Inspiringly named Mercator, the Martin XP4M-1 Naval patrol bomber has two Pratt and Whitney Wasp Major 28-cylinder four-row piston engines and two General Electric 1-40 turbo jets. The maximum speed with all four engines is nearly 400 m.p.h.*

b *An Allis-Chalmers turbo jet (essentially the de Havilland Goblin) supplements the power of the Pratt and Whitney Double Wasp piston engine in the Curtiss XF15C-1 Naval fighter.*

c *Following the classic Meteor layout, the Curtiss XP-87 night and bad weather fighter is unusually large for a machine of its class. This size is partially accounted for by a very heavy fuel and armament load. The installation of a gun turret has been considered.*

d *Development of the Bell XP-83 long-range escort fighter (two General Electric 1-40s) is believed to have been abandoned. This very heavy type succeeded the original Bell Airacomet.*

e *The Ryan XF2R-1 Navy fighter is seen forming wing-tip trails. Like the Consolidated-Vultee XP-81 (f), this type has a General Electric TG-100 airscrew turbine in the nose. Supplementary power in the Ryan is provided by a 1-16 turbo jet; the XP-81 has an 1-40 for the same purpose. Both are "all-altitude" fighters.*

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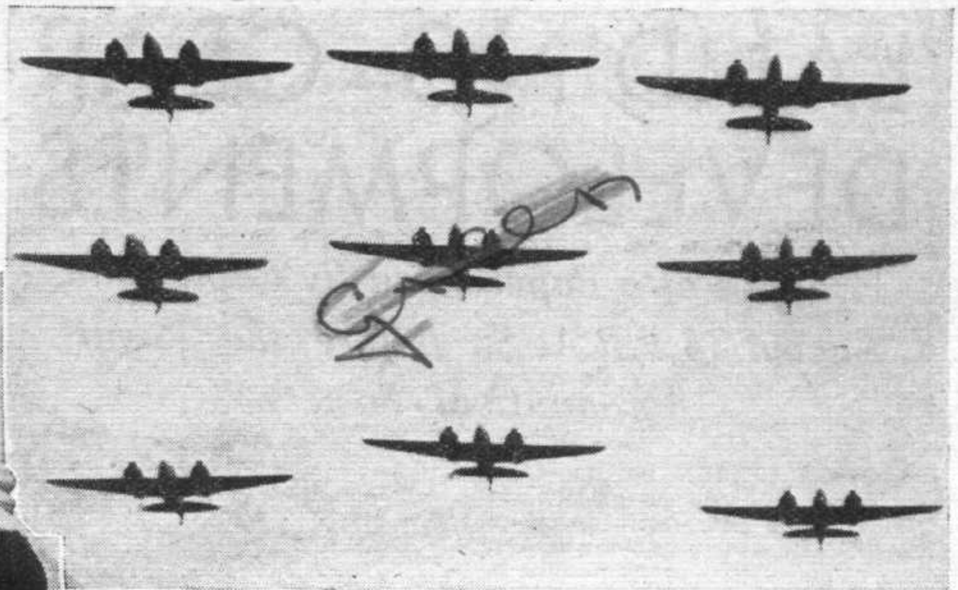


It will be evident from the above that Italian pilots have lost none of their skill in formation flying. The aircraft are Baltimores. On the left Dr. Thurston chats with aeromodellers.

British Enthusiasts Attend Aviation Day at Centocelle

EIGHT aeromodellers from the Northern Heights, Bradford and Halifax Model Flying Clubs flew to Rome on October 23rd in response to an invitation from the Italian Aero Club to attend an Aviation Day at Centocelle airfield, near Rome. They were joined by two others who travelled overland, and by Mr. S. Cotton, who flew out in his Lockheed 12, with two friends.

A cold front which swept Italy on the 25th caused a postponement of the Day until November 1st, so that the British visitors were able to fulfil a number of social functions. Guests of Dr. A. P. Thurston at a dinner included Prince Ruffo della Scallatta, Colonel Guiliani (President and Vice-President of the Aero Club of Rome), General Mazucco (Vice-President of the Aero Club of Italy), General Rampelli and Commander Francesco Grutter. W/C. C. M. M. Grece, D.F.C., the acting British Air Attaché, was also present. Dr. Thurston conveyed to his guests a message of good wishes for the success of their Day from Lord Nathan, and Prince Ruffo was made an Honorary Member of the Northern Heights Model Flying Club. Later the British visitors were entertained by Prince and Princess Ruffo.

On the day of the display at Centocelle 100,000 people arrived. The Minister of Defence, Signor Cingolani, unveiled a bust of Wilbur Wright and recalled that Mario Calderara, the first Italian pilot, had received his tuition from this great pioneer at Centocelle. The Chief Chaplain of the Italian Air Force said that, just as Christianity first spread from Rome, so Wilbur Wright came to Rome to spread aviation. In the name of all pioneers, Signor Caproni honoured the name of Wilbur Wright. Distinguished spectators included the Chief of Staff of the Italian Air Force.

The bust of Wilbur Wright, who instructed the first Italian pilot, unveiled at Centocelle by the Italian Minister of Defence.

Model Flying

The afternoon opened with a display by every kind of model, including control-line types, diesel and petrol models. This was followed by formation flying by Baltimores and aerobatics by a Fiat G.55. An outstanding event was the parachute descent in which Irvin and Sici parachutes were employed, the latter being of variable area, under the control of the pilot. Italian journalists then flew past in their own aircraft.

On Saturday, November 1st, a reception was held at the Aero Club of Rome, and a silver-gilt cup was presented by Prince Ruffo to British model flyers who attended the meeting as a souvenir of the re-establishment of friendly relations between Italy and Great Britain. The following day a reception was held by His Excellency De-Cesare, acting Lord Mayor of Rome, in his chambers on the summit of the Capitoline, one of the greatest honours which can be bestowed by the City of Rome upon visiting foreigners.

Before the British team left Rome the following message was received from the Italian Minister of Defence by Dr. Thurston: "Please accept my personal and heartfelt thanks for your having participated in the flying display at Centocelle. Your stay in Italian territory will serve so much as a means of creating sincere friendship bewteen Italian and English aviators as both are working together towards the difficult conquest of the paths of the air for the benefit of mankind."

Much of the credit for the success of the Aviation Day was due to Signor Guido Matteoli, one of the veterans of Italian aeronautical journalism.

LANDING GEAR DEVELOPMENTS

Synopsis of a Paper Read By Capt. Rene Lucien, A.F.R.Ae.S., Before the Royal Aeronautical Society

THE author is Chairman and Managing Director of the French Messier Company, his association with that famous concern dating back to its earliest days. He escaped to this country when France was inundated and joined the Free French Forces, serving, not with the Air Force, but with the Artillery.

CAPTAIN LUCIEN introduced his lecture with a diffidence which was Gallic only in its graceful appeal for criticism whereby, to paraphrase his own words, "our efforts may be pursued in the direction of true progress."

After reviewing the general scale-up of the factors which have a special effect on landing-gear technique, the lecturer went on to say that the general tendency of aircraft designers in France as well as in Great Britain has been, until recently, to use a freely castering nosewheel, the steering control of the aircraft being effected by differential braking. However, the use of transport aircraft, particularly in the United States, where traffic is intense, would seem to favour the general adoption of the steerable wheel. The greater part of the new French designs incorporated this system.

Of the latter type the lecturer described a particular unit which has been proved in service, and which has a simple servo control adapted from a preselective follow-up system for flap actuation. The pilot is provided with a small three-position selector with which he can select (i) servo steering by the use of a small auxiliary steering wheel, (ii) swivelling freedom of the nosewheel, with a small centring action for stability and shimmy damping only, and (iii) full caster locking. During retraction the steering is automatically disconnected, the wheel centres and the steering control is effectively isolated.

Captain Lucien queried why the castering main wheel layout for light aircraft has been so slow in finding support among pilots, and said that it was so natural a conception for the landing gear that Bleriot made use of it for his flight across the Channel.

On the subject of braking, the lecturer first referred to the increased kinetic energy to be absorbed due to the advance of landing speeds and, as a corollary, the advent of the tricycle undercarriage which, on the one hand, has reduced to a negligible value the kinetic energy lost by air drag forces, but, on the other hand, permits a much higher drag torque unlimited by overturning considerations. Further, the international requirements demand that the aircraft can be brought to rest in a very short time in the event of an engine failure at take-off.

S.T.F. Requirements

These considerations have caused the French Service Technique to assume new braking requirements, one of which is for a torque factor of 0.8 (=0.52 g) in an extreme emergency, the tyre-to-ground coefficient of friction being assumed to be 0.65. The application of this results in an appreciable increase in the dynamic load on the nosewheel and a consequent serious increase in the weight of this unit.

A reduction in this regulation has, therefore, been sought and a compromise for future applications has been reached, viz.:—

(a) The energy absorption factor allowing for losses due to drag is to be taken as 0.9 for tricycle undercarriages and 0.75 for orthodox types.

(b) A mean landing speed of 100 m.p.h. is assumed because standard wheels have been obligatory for many years in France.

(c) The normal brake control system generally uses pedals connected independently to the brakes on port and starboard undercarriages and so arranged that the torque factor will not in any event exceed 0.7 (=0.43 g). It is also provided that the optimum value of the torque factor will be determined during prototype tests on each type of aircraft.

(d) The emergency brake control uses an independent exhaust pressure and duplicated pipe lines; it is arranged to operate at two different settings. The first position provides the normal brake pressure and torque; this is used in the event of failure of the primary system or for parking. The second position calls for some special manœuvre—generally the breaking of a seal—and corresponds to an emergency torque factor of 0.8.

Furthermore, it is understood that this position is to be used in the event of real danger only, and that loads may be applied to the undercarriage structure which exceed the proof strength. Consequent full inspection of the landing gear after an emergency stop will be obligatory.

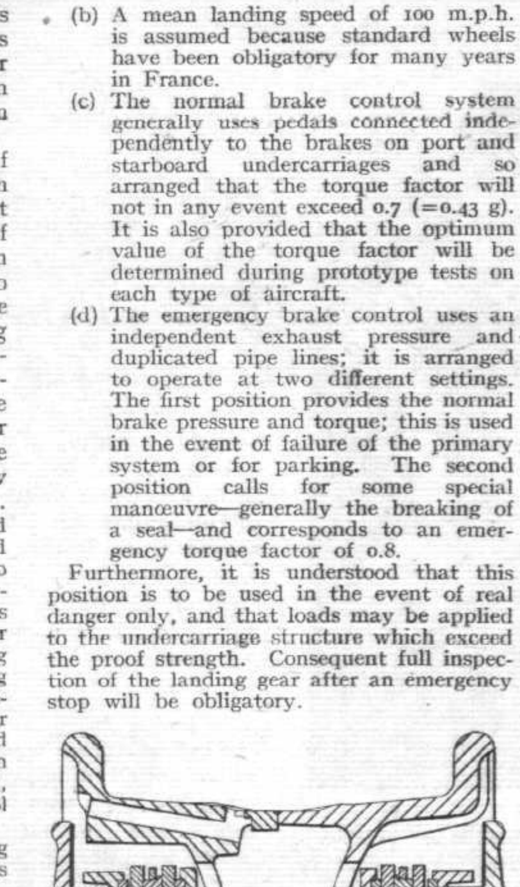


Fig. 1. A new French multiple-disc type brake in which the brake pads are well spaced for cooling air circulation.

In practice, brake design inevitably means finding a satisfactory compromise between various contradictory factors. Captain Lucien went on to say it would be interesting to allow an increase in the final temperature of the discs, as this would save an appreciable amount of weight. But it must be remembered that a final mean temperature of 500 deg C corresponds to a considerably greater surface temperature; obviously the lining material must be able to resist such temperatures. In the case of synthetic resin materials such temperatures

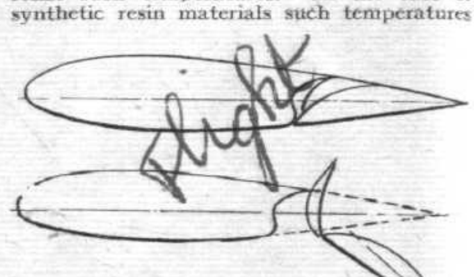


Fig. 2. A suggestion for double-flap aerodynamic braking.

would cause the distillation of the resin and possible combustion. The surface of the discs may be plated with hard chrome to increase abrasion resistance; however, around 800 deg C (the surface temperature approximating to a mean final temperature of 400 deg C) chrome oxide will form which, having no mechanical strength, will instantly be torn off.

A new French disc brake is illustrated in Fig. 1. This design has good thermal isolation of the tyre, the rotary discs being driven by hollow cylindrical sleeves. The brake pads are spaced sufficiently to permit a good circulation of air across the discs, and they can be replaced simply, without special tools.

Although aerodynamic braking is not in itself warranted for inclusion in a study of landing gears, the lecturer felt that it should be mentioned since there is a need for finding means to compensate for the loss in drag due to the tricycle undercarriage layout. Apart from braking airscrews there is the interesting possibility of the use of variable-incidence wings. For example, an aircraft fitted with double flaps could have a considerable increase in drag by swivelling the intermediate flap, the movement simultaneously closing the slots and obstructing flow over the upper surface of the wing as shown in Fig. 2.

Shock-absorber Qualities

Turning to shock-absorber performance, Capt. Lucien observed that the increase in wing loading and the consequent raising of landing speeds results in making even more contradictory the qualities required in a good shock absorber, viz., to absorb the maximum amount of energy at the moment of landing, and to be sufficiently resilient during taxying so that accelerations due to ground inequalities are not transmitted to the airframe. The Chausson, the Katz and the Messier shock-absorber systems were all referred to by the lecturer, who stated that the variable orifice inherent in the latter system enables efficiencies of well over 80 per cent to be obtained.

On the subject of low-temperature effects due to flight at great altitudes, it was stated that attention in France has recently been concentrated on silicate-base fluids, and they

Landing Gear Developments . . . . .

have evolved the basis of a fluid which appears to meet the full requirements; long-range tests are, however, needed. In reference to increase in speed of operation, French practice is to use compensators of various forms which, however, do not appreably reduce inertia loading in the retraction gear due to vertical accelerations. Further, each jack, etc., to be controlled is provided with a hydraulic relay mounted close to it and using either a secondary relay hydraulic or an electric system to effect remote control. The lecturer then briefly reviewed the advantages and disadvantages of various methods of control before passing on to the subject of strength requirements.

Captain Lucien questioned how the stressing case demands specified by the I.C.A.O. have been arrived at, and suggested that the individual faults of particular aircraft have been responsible for the increase in the severity of stressing cases applicable to other types of aircraft not suffering from the defect. The fact that each country studies the requirements of others very often causes further revision which is, obviously, always in the direction of increased severity. The lecturer then suggested that the future development of stressing requirements should be based on systematic experiments where, by varying a single factor only at a given moment, it should be possible to determine laws, or at least to draw envelope curves, which will give some idea of the extreme limit of loads to be applied to the various cases.

As an example, an investigation has been carried out into the application of the latest French stressing cases to an undercarriage of German origin, manufactured in France since the liberation to meet the immediate needs for civil communication. These undercarriages are used daily in more than 200 aircraft and refuse obstinately to be broken, yet Fig. 3 shows how far short of the official requirements they are. The lecturer expressed the belief that it would be in the general interest, (a) for requirements to be established on an international plan based on systematic tests which would allow the cases at least to approach reality and, (b), that each country arranged to use the internationally established requirements as a basis, complementing it if it must, and even exceeding it, to meet its particular needs. But it is illogical for a designer to have to check to his own national requirements and then to have to check again against the 17 cases of the I.C.A.O.

Referring back to braking, it had been shown that the use of a torque factor of 0.8 could bring about a dynamic loading of the nosewheel leading to the use of a much larger wheel and tyre than would be needed to deal with the static load, and thus to an appreciable weight penalty on the structure. Furthermore, as regards the main wheel, the increase in landing speed caused a serious increase in the weight of the mass which is used to store the landing energy on braking. "One could say without exaggeration," observed the lecturer, "that wheel weights as they have been known up to recent times may be increased by as much as 15 to 30 per cent. All these considerations have led us to believe that the conditions will be made less stringent in the future by discounting the possibility of an eventuality which may never occur."

Tricycle Three-point Landings

It seems appropriate to investigate means for making full use of the nosewheel tyre capacity provided to deal with the dynamic loads. To achieve this, means must be found to allow touch-down on all three wheels (or sets of wheels) simultaneously. To take full advantage of this, the undercarriage shock absorbers must be put in balance, by hydraulic inter-connection, to eliminate pitching loads which occur when one wheel touches the ground first. The advantages of this system are as follows: (i) the possibility of transferring part of the main wheel load to the front wheel; (ii) the possibility of having all three wheels identical; (iii) a reduction in the height and weight of the undercarriage; (iv) improved performance due to the fuselage shape being an optimum aerodynamically, and uncompromised by considerations of take-off angle of attack; (v) improved take-off due to the airscrew thrust line remaining parallel to the direction of motion; (vi) reduction in structure weight; and (vii) improved braking.

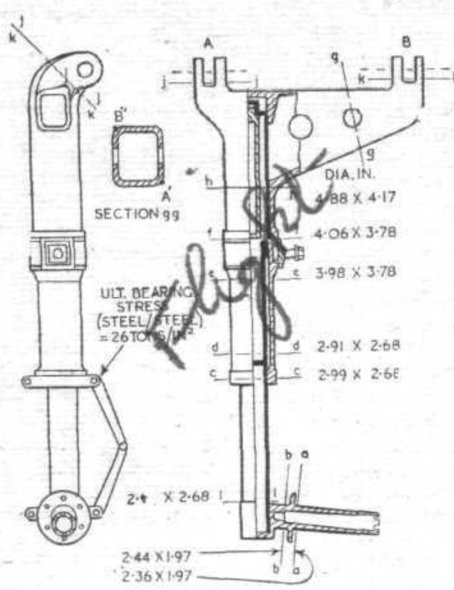
The lecturer commented that the basis of strength calculations of undercarriages in almost all countries is the specification of an arbitrary drop height or vertical velocity supposed constant or "airborne." All dynamic tests in the U.S.A., as well as in Britain, make use of free and, therefore, accelerating, drops of the undercarriage, which covers the mass above it. In France, on the other hand, truly representative constant-velocity drops are made by balancing the mass when it has reached the required velocity.

With the British and American system the mass dropped must be reduced to adjust the energy to the appropriate amount, bearing in mind that it will be that due to the total height (dropped height plus deflection). With a long-travel undercarriage the mass dropped may be only half to two-thirds of the correct mass, and the lecturer confessed his belief that the shock-absorber orifices determined by this method will not be correct. He expressed a desire to receive expert views of his hearers on this subject and suggested that a test programme might be drawn up to enable comparative tests to be made to settle this interesting problem.

Some interesting comments were made on the subject of light-alloy castings for undercarriage structures, France having been, during the last twelve years, the champion of this technique. It was stated that the belief is now current that castings should, however, not be used for aircraft of more than 80,000 to 100,000 lb weight because the sections necessary become excessively thick for proper casting.

Regarding the use of steel, Captain Lucien recalled that there have been two methods of development evident in recent years, the one originating in Germany using steel castings welded to steel pressings and tubes, and the other exploited mainly in the U.S.A., making use of large stampings with or without the use of flash welding, but he thought that from a weight standpoint the German method could not compete with the American solution.

The difficulties of retracting bulky landing-gear units become increasingly apparent with the advent of laminar-flow wings and, in addition, fuselages which are so often full of jet pipes, engine components, etc., that there is scarcely room there either. Furthermore, the introduction of swept-back wings increases the severity of the problem, due not only to the obliquity of the spars, but also the position of the centre of gravity in relation to them. The lecturer could not suggest a general solution to a problem with so many particular aspects, but gave illustrations of some recent designs, including the Morane hinged-wheel system where, prior to retraction, the wheel is swung about a longitudinal axis until it lies at right angles to the leg axis, then retracts into a vertical trough in the fuselage, the leg only remaining in the wing. Reference was also made to contraction of shock-absorber travel during retraction, this system being used for Meteor aircraft, although the lecturer thought it was probably done first on a Caudron aircraft in 1938.



Component	Material	Allowable Stress	Section	Stressing Case	Actual Stress	RF
		lb/in²			lb/in²	
Axle	Steel Casting	128,000	a-a b-b	X X	238,000 204,000	.54 .63
Piston Tube	Steel	156,000	c-c d-d l-l	X X X	277,000 235,000 287,000	.56 .66 .54
External Tube	Steel	156,000	e-e f-f	X X	270,000 282,000	.58 .55
Casing	Magnesium Casting	13,450	g-g (A') g-g (B') h-h j-j k-k lug A lug B	X X X Y X Y X	20,200 16,900 45,300 19,000 22,600 18,800 15,350	.66 .79 .30 .71 .60 .71 .87
Toggles	Steel	128,000	Attach. Lug		107,500	1.19

X = Sideload Outboard. Y = Sideload Inboard.

Fig. 3. Comparison of the NC. 701 undercarriage as flying, and as stressed to latest French requirements.

Tandem Undercarriages

Captain Lucien also referred briefly to the use of tandem undercarriages in the United States and, in this connection, recalled the original Messier aircraft of 1931, which had two wheels mounted in tandem in the fuselage with outrigger skids for slow-speed stability. This is largely akin to the modern form, except that the skids are replaced by small wheels. Apart from the interest of such a layout for removing the undercarriages from the wings, it has the particular feature of making possible much heavier braking than is now feasible.

"There is no doubt," observed the lecturer, "that the skid undercarriage is going to come in some form and for some operational types of aircraft, particularly naval machines. In this connection, the German Me 163 and AR 234 are interesting pointers."

Referring to runway equipment, it was stated that maximum tyre pressures of 150 lb/sq in have been the limit of experience to date, but tyre pressures up to 300 lb/sq in have been tested experimentally in the United States which seemed to point to the ultimate possibility of all-metal runways.

On the subject of assisted take-off runway devices, the lecturer made reference to the Westinghouse Electropult, and to the auxiliary wheel bogie which has been used successfully in Germany in the shape of a light and detachable pair of wheels which

(*Continued on next page*)

HERTS AND ESSEX CLUB DANCE

ONE of the best known and most active of our aero clubs, the Herts and Essex of Broxbourne airfield, held their annual dance at the Park Lane Hotel on November 4th. A large number of people were present, almost all of whom were club members and a good proportion full flying members. During the evening the Minister of Civil Aviation looked in on the party and aptly remarked on the gay scene, saying that private flying clubs were reputed to be more or less down and out, but that on this occasion the Herts and Essex Club at least seemed to be up and kicking. In more serious vein Lord Nathan said that he knew everyone was expecting him to give optimistic reports on the Whitney Straight recommendations. This he could not do at present, but he nevertheless assured guests of his enthusiasm and support for private flying and gliding.

An excellent and varied cabaret, a spot dance, novelties, souvenirs for the ladies, and good food and wine, all these combined to produce a pleasant and entertaining evening.

A FIRST ANNUAL DINNER

LAST Saturday the Airways National Sectional Council held its first annual dinner at, appropriately enough, the National Hotel in London. As many of our readers may not be familiar with this body, it might be explained that it is a section of the Association of Supervisory Staffs, Executives and Technicians, which was formed nearly 30 years ago. An agreement has been signed between A.S.S.E.T. and the three Airways Corporations, on behalf of foremen, assistant foremen, chargehands, section inspectors, inspectors and storekeepers. Last year the Joint Council for Civil Air Transport was formed at a meeting attended by the Minister of Labour and the Minister of Civil Aviation. This Joint Council is composed of representatives from A.S.S.E.T. and ten other trade unions recognized by the Airways Corporations, and managerial representatives of the Corporations. The Airways National Sectional Council acts as an advisory body to the National Executive Council of A.S.S.E.T. Its chairman is Mr. Ian Mikardo, M.P., who also took the chair at the dinner.

Principal speaker was Mr. G. S. Lindgren, M.P., Parliamentary Secretary to the Ministry of Civil Aviation. Other speakers were Mr. H. G. Knight, General Secretary of A.S.S.E.T., Mr. Mikardo, Mr. Shrosbury of B.O.A.C., Mr. G. Hitchings, Chairman of the National Joint Council for Civil Air Transport, and Mr. J. H. Williams, President of A.S.S.E.T. All stressed the friendly spirit in which negotiations with the Corporations had been carried out, and the need for training to qualify for higher posts. Mr. Mikardo pointed out that the National Joint Council for Civil Air Transport had pioneered the movement. Other industries were now following their example. He announced the fact that membership had just reached 1,500.

FEEDER SERVICES IN SOUTH AFRICA

LICENCES to operate feeder services have been granted by the South African Minister of Transport, Mr. Claude Sturrock. Air Trans Africa, Ltd., have been granted licences covering nearly the whole of the Union; Northern Cape Flying Services (Pty.), Ltd., are to serve ten centres, radiating from Kimberley; Karroo Flying Services, Ltd., are to provide local lines for 15 Karroo towns, with an outlet to Port Elizabeth; and Commercial Air Services (Pty), Ltd., are to operate round Basutoland, extending to the Reef, Durban and East London—a route mileage of 1,640. When a route of any company coincides with one operated by the major company, whose network covers most of the Union (Trans Africa, Ltd.), the licence for traffic between the two towns concerned would, said Mr. Sturrock, be granted to the local operator.

The Minister was speaking at the third annual general meeting of the Commercial Aviation Association of South Africa when he made the foregoing announcement. The Association's membership embraces a great number of the privately owned and operated air services, and later the Minister was asked why commercial operators were excluded from the conferences convened by the Civil Aviation Advisory Committee, at which B.O.A.C., the South African Railways and other Government-sponsored air operators were present. It was explained that such conferences were on a Government level, but on behalf of the commercial operators it was then put forward by the meeting that if they had been represented, it was hardly likely that the recent Southern African Air Transport Conference would have recommended stricter licensing to reduce competition.

Landing Gear Developments (continued) . . . . .

are left behind at take-off. At the moment, work is in hand on a type of bogie which, fitted with a steerable nosewheel and fully radio-controlled, can be used as a take-off device for fighters (landing being on a skid) or for guided missiles. The French Michelin Company was stated to be developing interesting tyres inflated at 350 lb/sq in especially for such a bogie.

In concluding his lecture, Captain Lucien appositely remarked that the undercarriage was an essential intermediary between the aircraft and catastrophe. The work of I.C.A.O. has produced a set of conditions for the stressing of landing gear which, differing as they do from the latest national requirements, make additional mathematical verification necessary. The French Service Technique is about to revise its requirements, using the I.C.A.O. requirements as a basis and tightening up only when particular circumstances make it vital. "We wish," said Captain Lucien, "that this example could be followed in every country; it would be the first step towards the international agreement that will one day dominate our industry. Furthermore, and as regards the standardization of the elements, we believe that, pending a comprehensive organization of international standards, immediate action on an international basis should be taken to standardize five or six tyres from those which are the most up to date (starting, for example, with the Dakota and Constellation), each manufacturer making those sizes and overcoming any chauvinistic leanings in the general interest."

DISCUSSION

Mr. G. H. Dowty opened the discussion by recounting some of the intricate problems that the undercarriage specialist is called upon to diagnose and solve. He mentioned the piquant case of one aircraft designer who, when told that his wheel size was too large for the surrounding structure, blithely suggested that the tyre might be deflated upon retraction! He heartily agreed with the lecturer that simplicity in design came foremost; thus, in the case of shock-absorber design he felt that the complexity of many current designs was unnecessary, and he "had heard" that liquid springing, in which the oil itself is compressed in volume, might be the simple answer. Regarding the now hoary argument between hydraulics and electrics, he was still very much in favour of fluid pressure systems, but agreed that a very good case could be made for the electro-hydraulic combination, which eliminated considerable plumbing. Finally, he questioned the lecturer's statement regarding the limitation of pneumatic systems to 1,200-1,400 lb/sq in, since he knew of successful designs with a pressure of 5,000 lb./sq in.

Mr. N. E. Rowe made a plea for the possible elimination of the undercarriage altogether—at any rate in small aircraft. Regarding the need of standardization, he warned that this should not be overdone, otherwise they might cramp the inventive initiative of designers. Contrary to both Capt. Lucien and Mr. Dowty, who gave him the impression that the aircraft should be designed around its landing gear, he suggested that the opposite was the sounder design procedure, although he agreed that the undercarriage specialist should be asked to collaborate right from the beginning.

Mr. W. Tye, referring to the lecturer's remarks on international stressing cases, said he spoke somewhat on the defensive, in that wartime experience had tended to merge the British and American airworthiness rulings, as a natural result of the pooling of technical data. He agreed, however, that a great deal of systematic strength testing was needed in order to sift good and bad design practice; it might then be feasible to reduce the present large number of stressing cases, particularly since the conditions of civil operation were likely to be less onerous than military requirements in wartime.

Mr. R. S. Stafford asked whether locking control for the nose wheel was really necessary. He believed that the high drag factors specified in current airworthiness requirements were unduly excessive, probably as the result of poor shock-absorber design.

Prof. Temple gave a learned dissertation on the qualities required in freely castering wheel systems. He outlined some of the good and poor torque characteristics of different types of self-centring mechanisms and shimmy-dampers — particularly mentioning the excellence of the Cowey design, which, he thought, was not so well known as it deserved to be.

Mr. H. G. Parker expounded on the technique of light alloy castings, with particular reference to their low factor of safety and the cost of the equipment required to explore their strength properties; he was inclined to think that the extra cost outweighed any weight-saving. He would like to have heard something more about French practice regarding emergency systems, since there appeared little unanimity in that respect. On the question of undercarriage locking systems, he believed that French-Messier was in favour of internal locks, whereas British designers seemed to prefer external locks. What were the lecturer's views on over- or dead-centre mechanisms without any locks? Regarding the stringency of the many stressing cases now required, he commented on the common experience that the undercarriage structure, when tested, generally had quite a bit of reserve strength over the computed values.

Mr. Woodford said he favoured the application of electric power for driving hydraulic pumps; moreover, he firmly believed that the all-electric system had many advantages, in view of the many other electrical services now to be found on modern aircraft.

In Production—for the Royal Air Force

The Percival Prentice T. Mark I, designed to Air Ministry Specification, is a 3-seat trainer of metal construction. It is in production for use by the Royal Air Force for basic flying training, aerobatics, instrument flying, navigational and radio training. Instrument flying training screens are provided and can quickly be placed in position or stowed away whilst the machine is in flight. Electric intercommunication and radio equipment are fitted, whilst additional equipment for specialised training may be installed in place of the third seat.

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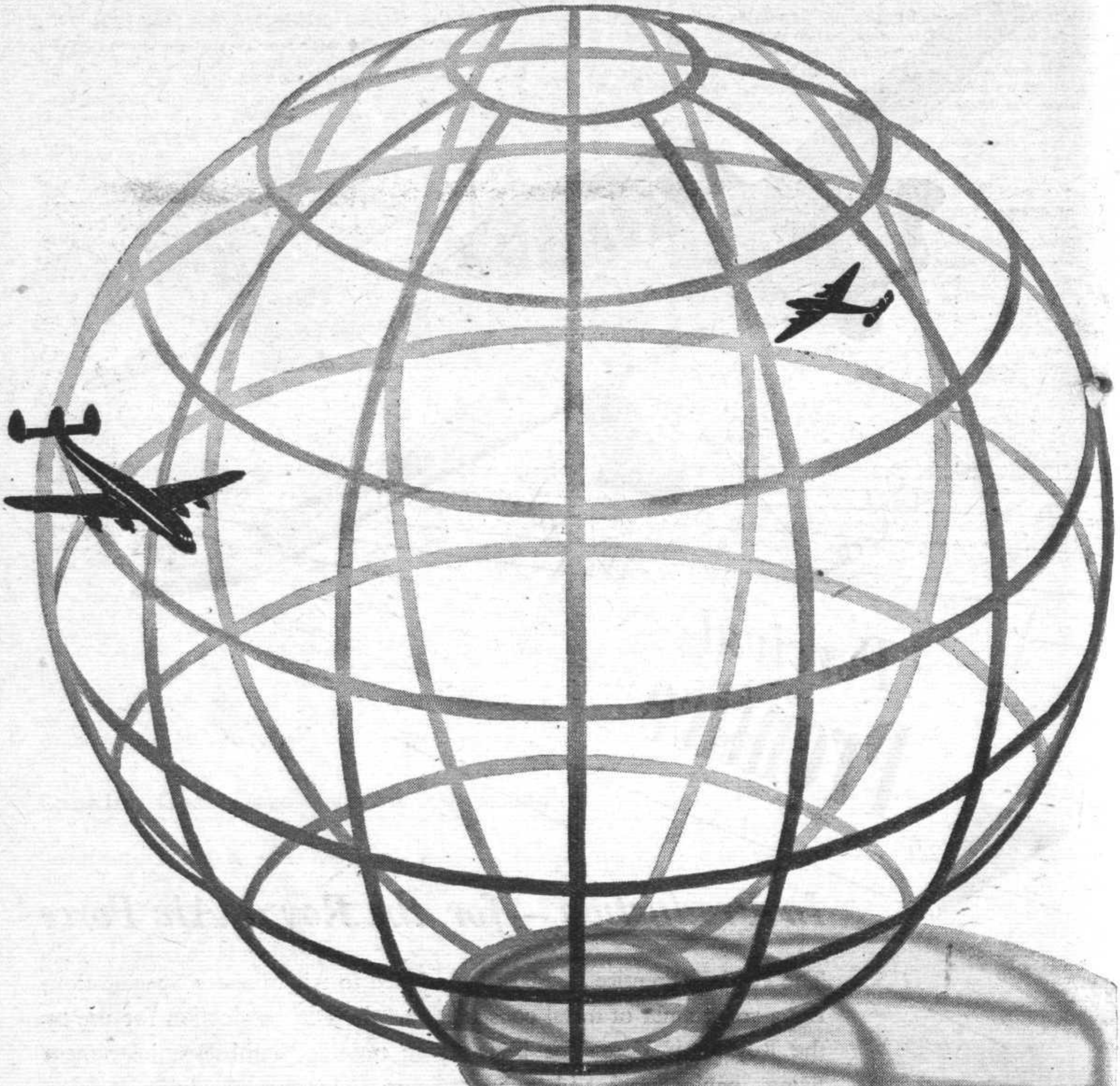

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CIVIL AVIATION NEWS

LOOKING NORTH-EAST: A K.L.M. Dakota standing on the extended portion of the 050/230 runway at Schipol, which now measures 2,530 yds. It is the main instrument runway and its equipment includes S.B.A., I.L.S. and full contact lighting. The East-West runway also is being lengthened, at the western end, but, since the present approach is over the tarmac, the third runway, measuring 2,300 yds. will be constructed parallel to the existing 140/320 runway.

Start of West African Services : Travel Statistics : B.O.A.C. Requirements for a Medium Range Aircraft for Empire Routes

INDIRECT CARGO CARRIERS

THE American Civil Aeronautics Board are considering the introduction of a new category of air operators to be known as "Non-certificated indirect cargo carriers." Such a carrier would be permitted to transport property by air for compensation, without itself physically operating aircraft, but by utilizing the services of some other organization. The area of operation would be unlimited. The Board proposes that under the provisions of the new regulation, if permitted, the indirect carrier may deliver property for transport only to those certificated and non-certificated companies which hold effective Letters of Registration or operate under foreign permits. The effect would be a restriction on indirect carriers to use only those operators who are authorized for the carriage of property by air, and they will be subject to economic regulations including the filing of tariffs, and the declaration of accounts and reports.

WEST AFRICAN AIRWAYS

GOOD progress is being made by the West African Airways Corporation, whose first services have now started. Many points in the interior of Nigeria are joined to Lagos by air and through the link with B.O.A.C.'s trans-Sahara route, London is now within two days' travel of Nigeria. Future plans include services between the four colonies of Nigeria, the Gold Coast, Sierra Leone and Gambia, extension of interior services and links to Khartoum, Cairo and East Africa, while charter work is an important part of the Corporation's activities. A recent instance of this, a flight to the sources of the Niger with an Anglo-French Commission, was noted in *Flight* last week.

Two of the seven de Havilland Doves which are on order have been delivered and three Miles Marathons are also on order. Each of the Doves carries a pilot and radio officer, seconded from B.O.A.C., and the colonial governments are providing meteorological and other such services. Capt. W. Armstrong, of the Technical Director's staff, B.O.A.C., who

ADVANCED TRAINER: Since the handling characteristics of the Dove are said to resemble closely those of the Constellation, B.O.A.C. have put the Dove into service at Dorval for crew training. A D.C.3 and Lockheed 14 were considered as alternatives, but the cost of operation was estimated to be nearly twice that for the Dove, even though the D.C. 3 would have been bought at war-surplus price. In the photograph are (left to right) Capt. W. S. May, Chief Flying Instructor, B.O.A.C., First Officer N. E. Freeman First Officer D. J. Bellingham, and Mr. B. Peterson, No. 3 line, B.O.A.C.

Civil Aviation News . . . . .

recently returned from a survey visit to West Africa, reports that outstations are remarkable for their good runways. Of compacted earth covered with laterite soil, they have a hard surface and are usable even during the heavy tropical rains.

The chairman of the West African Airways Corporation is Sir Hubert Walker, also Director of Civil Aviation, Nigeria, and Mr. B. C. H. Cross is its general manager.

AIR TRAFFIC CONTROL OVER FRANCE

ALL British aircraft flying to and from the United Kingdom and France are to adopt a standard procedure for air traffic control. On leaving the United Kingdom Control Areas or Flight Information Regions aircraft will be instructed to change frequency to the appropriate French Area Control station. If the flight proceeds normally communications will be maintained, but should an emergency arise and information be required for landing back in the U.K., then the aircraft must first seek such information from the appropriate French Area Control station. If the information is not available, permission to change frequency to Gloucester W/T station must be requested. After such information has been passed the aircraft is to revert to the French frequency, inform the French Air Traffic Centre of the proposed course of action, and remain on that frequency until permission has been obtained to change to the U.K. Area Control.

Inbound aircraft are to maintain communication with the appropriate French Area Control station until permission is given to change to the U.K. Area Control, that is, on crossing the Flight Information Region boundary. If an aircraft is unable to obtain all the necessary information from U.K. Control, then frequency may be changed to the Gloucester W/T station, after approval from the French Area Control has been obtained. After information has been passed the aircraft is to remain under French Area Control until instructed to change to the U.K. Area Control.

It is emphasized that while aircraft are over French territory they are subject to French Air Control traffic instructions.

BRITAIN'S AIR VISITORS

ONE-THIRD of all visitors to Britain this year travelled by air. By the end of the year it is likely that we shall have had 350,000 visitors, and their total expenditure in this country, exclusive of passages, is estimated at £20,000,000. This tribute to the value of air travel in the "Come to Britain" movement was made by Lord Hacking, chairman of the British Travel Association, in a statement made in London on November 6th. In view of our domestic and transport problems, he said, only 250,000 had been expected, but by the end of September over 312,000 had come, and the occasion of the Royal wedding will raise considerably the total for the year. During the peak summer months the number was equal to 90 per cent of the equivalent traffic in 1938.

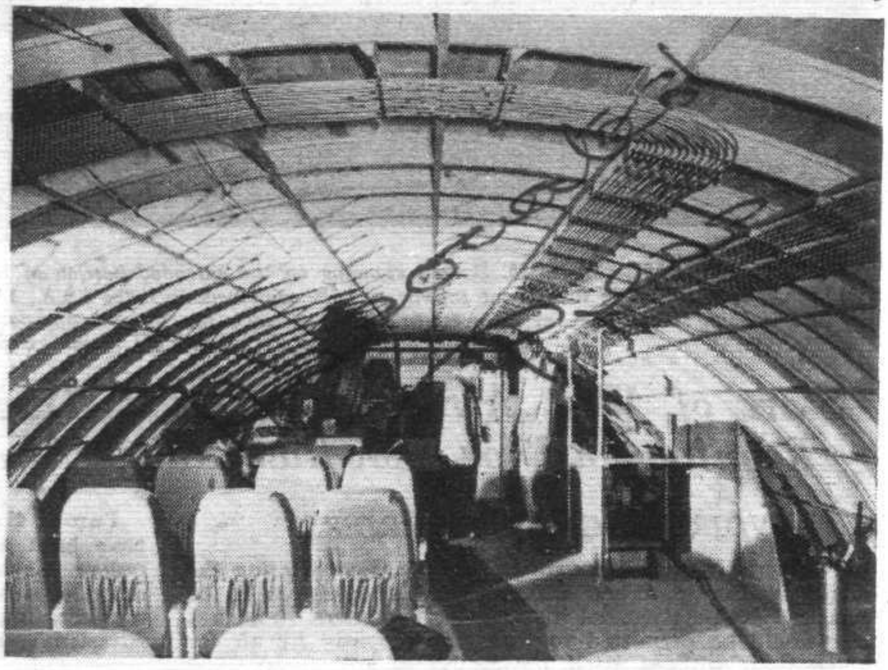
Next year's visitors are expected to number about 450,000, of which about 100,000 will be from North America. Owing to transport difficulties Empire visitors will probably number only 50,000 or 60,000. The U.S. Department of Commerce expect Americans to spend $1,400,000,000 on foreign travel, a large portion of which will come to Britain.

AIRCRAFT FOR THE TASK

B.O.A.C., as is well known, are faced with the problem of operating the Empire routes with aircraft which are uneconomic. The Brabazon Committee anticipated such a situation and drew up the specification which became known as the Brabazon III. It has not materialized, however, since the requirement specified airscrew turbines, and development of such power units has been slower than anticipated. The Tudor series were intended as interim aircraft only, and in November, 1946, the Corporation stated its requirements for an aircraft suitable for the task to be performed and ready for operations in about five years' time. The task was the operation of all Empire routes, and the problem is to fly from airfields which are inferior, and where runways are not capable of taking aircraft of great weight. Since turbines of the required size are not likely to be sufficiently advanced to allow of their reliable operation within about five years, the Corporation are content to accept an aircraft powered by normal piston engines and with a higher degree of efficiency rather than high speed. Apart from the normal considerations for a passenger aircraft, other limitations on the Empire routes have to be studied: for example, the well-known bottle-neck between Karachi and Calcutta governs largely the size of aircraft and the range of operation. There is another bottle-neck between Nairobi and Johannesburg, but there are reasonable hopes for development of airfields on that stage.

The broad requirements are for an aircraft with nosewheel undercarriage, powered by four engines, providing accommodation for about 32 passengers and their baggage plus 2,750 lb of mail and freight. The operating height must necessarily be about 20,000ft, which would naturally require a pressurized cabin, and at this height a cruising speed of 320 m.p.h. In order to cover a stage length of 1,354 statute miles still-air range must be about 2,500 miles.

Owing to the rigorous conditions on many of the routes the aircraft must be capable of operating independent of external aids except when with engines stopped it is on the ground. Flexibility for ease of operation is therefore of the utmost importance. Such an aircraft will probably have an all-up weight greater than 90,000 lb, but will be larger in size than the Constellation, more efficient on a cost basis, and capable of future development. The requirements were passed to the Ministry of Civil Aviation who, after examination, passed them to the Ministry of Supply, who in turn sent out tenders to all the British manufacturers. It may now be said that the Bristol Aircraft Company will build an aircraft to their own specifications to suit B.O.A.C. requirements. It is already well known as the M.R.E.—Medium Range Empire.

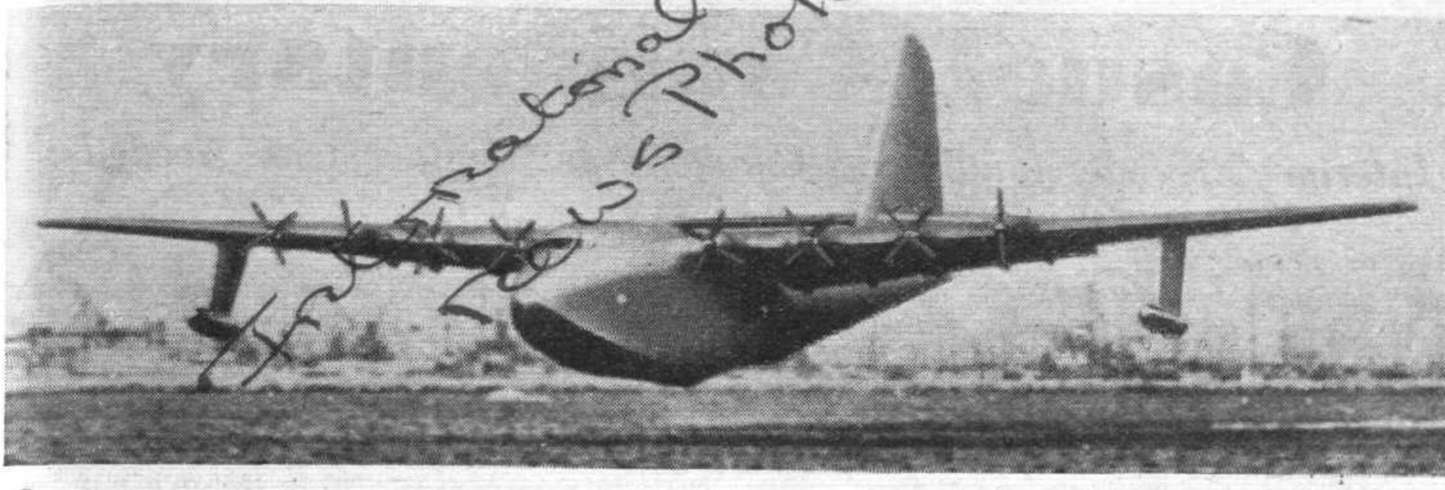


750-SEATER: The forward upper deck of the Hughes Hercules. Within the 220-ft-long hull seats for up to 750 passengers can be provided. Mr. Hughes, himself a six-footer, gives scale to the picture.

B.E.A. SEPTEMBER TRAFFIC

THE following figures for September, 1946, and September, 1947, illustrate the increase in traffic handled by the British European Airways' Continental Division during the course of the past twelve months. This has been accomplished with only a small extension of route mileage. Statistics for the combined Continental and U.K. divisions are also shown, although no comparison is possible as the latter only took over the internal services early this year.

	Continental Division Sept., 1946	Sept., 1947	*All Divisions* Sept., 1947
Passenger Services completed	734	859	8,635
Aircraft miles flown ..	378,632	480,865	1,332,400
Passengers carried	11,510	18,292	69,459
Passenger miles flown	5,390,571	8,184,503	15,133,000
Mail carried (lb)	138,600	99,000	236,300
Freight carried (lb) ..	118,800	286,000	428,600
Route mileage	10,472	10,646	17,035



GARGANTUAN GRACE: *Despite its vast size (the span is 320 ft) the Hughes Hercules, seen airborne, with Mr. Howard Hughes at the controls during taxying tests on November 2nd, has fine lines. The eight Wasp Majors deliver an aggregate of 24,000 h.p.*

BREVITIES

The D.N.L. service operating between Oslo and Rome is routed via Copenhagen, Frankfurt, Zurich and Marseilles. Time taken for the trip is two days, with an overnight stop at Zurich.

* * *

Construction work is to begin at once on an airport for Iraq, presumably at Baghdad, which is expected to cost about £2,500,000.

* * *

Lord Winster, the former Minister of Civil Aviation and now Governor of Cyprus, is in London for the Tudor I enquiry.

* * *

American Overseas Airlines are building an "Airways House" at Frankfurt, Germany. Beds for 200 will be provided, and a 400-bed hotel is to be built at the Rhine-Main airport outside the city.

* * *

Officials of K.L.M. flew to Teheran in a Skymaster last week, on a special proving flight. Informal discussions with Iranian Airways officials are taking place.

* * *

A concrete runway suitable for four-engined aircraft has been completed at Barcelona airfield. At Madrid, a 3,000-yd runway, the second of five, has also been finished.

It is understood that the Finnish Airline Aero O/Y will resume services between Helsinki and Stockholm in the near future.

* * *

British Guiana Consolidated Goldfields, Ltd., have constructed an airfield in the Potaro, one of the largest gold-producing areas in the country. It is one mile long, 250ft wide, and is suitable for Dakota aircraft.

* * *

The Air France Scandinavian office is being moved from Stockholm to Copenhagen. A branch office is also being opened in Oslo in preparation for the start of the Paris-Oslo service next April.

* * *

C.A.B. estimate that 80,108 passengers made transatlantic crossings by air during the first half of 1947, three-quarters of them by American airlines. The total for the whole of 1946—a year of restricted flying—was 104,980.

* * *

The October-November issue of Bradshaw's Air Guide includes revised diagrammatic maps of the European air routes, with service numbers corresponding to the tables in the Guide conveniently inserted. Reference is consequently very quick and simple. Freight rates have been included in the fares section, together with information on conditions of carriage of goods.

* * *

The new edition of I.C.A.O. Procedures for Air Navigation Services (Communications, Codes and Abbreviations) will not become effective before March 1st, 1948. It is understood that unexpected delays in translation are responsible for the hold-up.

* * *

So far 69 airlines have been admitted to membership of I.A.T.A., and other applications are pending. Airlines recently affiliated include B.C.P.A., Central African Airways, C.O.B.E.T.A., Aerlinte Eireann Teoranta and Aerovias Brasil. Lloyd Aero Boliviano is a new associate member.

* * *

Airlines appear to be gravitating towards Regent Street, London. The latest to open a West End Office there (at No. 75) is B.O.A.C., although Mr. Ashwell-Cooke has been installed in the premises for more than a year. The opening was celebrated with a cocktail party on November 6th. The new offices are of very modern style, and the intention is that No. 75 shall be an enquiry centre where information can be obtained about all matters relating to the Corporation's activities. [Tel. Regent 8444.]

FOR "OPERATION INDIA": *The first Dakota belonging to Kearsley Airways was despatched soon after delivery, to operate under the direction of B.O.A.C. in India. Left to right are Radio Officer Ball; D. J. Vaughan, Commercial Manager; Captain I. P. Grant; J. W. Kearsley, Chairman of Kearsley Airways Ltd.; Captain H. W. Waltham, and T. M. W. Smith, General Manager.*

Casual Commentary

Interim Misunderstandings : Charter-type Replacement Needed : Formulæ-Cheating, Why Not Jato ?

By ROBERT CARLING

WITHOUT any wish to reopen an acrimonious controversy—which, in the case of the Tudor and at the time of writing, is probably being adequately dealt with by the chosen committee of enquiry—I feel that one or two points about the whole "interim" plan might well be restated.

During the near-recent spate of words there was a quite remarkable tendency to forget the original object of this "interim" idea. People who should have known much better either complained that the types concerned were not up to modern civil aircraft standards in performance and controllability, or, worse still, tried to show that they were as good as, or even better than, aircraft of more modern design.

For the life of me I cannot see why anybody should have taken the trouble either to criticize or to praise. Interim aircraft, by their very nature, are neither better nor worse than they could be expected to be. By all means criticize the principle which caused them to be planned and produced in the first place, and by all means praise them for the fact that they function as well as they do. But no one could realistically expect perfection from aircraft which were direct or indirect conversions of military types, with many of the same or similar parts, and on which the design, aerodynamic and test work had necessarily been hurried. Had the manufacturers themselves been a little less enthusiastic, and a little more realistic in their own announcements, the public might not have been allowed so easily to forget the original objects of the "interim" plan and would certainly not have been permitted to imagine for a single moment that the types concerned were anything but honest stop-gap devices.

All of which is just another negative proof of the importance of absolute honesty and realism in all commercial dealings. You never get anywhere by pretending that a product is something better than it is, and may go a long way (even in pressure-sales circles) by understating your case. Surely the official line which should have been taken about all interim types might, from the very start, have been: "We make no absurd claims for these aircraft. They have been produced quickly to fill a need, are based on military designs, and will do the job satisfactorily until civil-designed-from-scratch British aircraft are available—and we hope that these will be *really* good."

As it is, we have only ourselves to blame if the rest of the world—and also, indeed, the British public—have been made to believe that these temporary expedients, worthy as they may be, represent our idea of the best commercial aircraft.

And by way of postscript to this comment, we in this country should get rid of a growing impression, forming in our subconscious minds, that we are not very clever or efficient by comparison with our transatlantic cousins. They, too, are suffering their prototype aircraft troubles, and have also been guilty of putting new aircraft into service long before all the bugs have been extracted. Pressurization, in particular, is still by way of being a bit of a nightmare.

The Small Twin

One of the less happy consequences of the so-necessary safety regulations formulated by the International Civil Aviation Organization may be that the smaller transport aircraft will die a natural death. It is very difficult to see how the charter type, at least as we know it, can, while carrying a worth-while payload, comply with the engine-failure requirements, or how special concessions are to be levered out of I.C.A.O. on a unilateral basis. For, after all, the small twin is essentially a British conception and no other country is likely to ask for any similar concession.

An up-to-date replacement for the type exemplified by the Rapide is certainly wanted very badly. It will be interesting to see whether really modern ideas in design, both aerodynamic and structural, can be applied so that such a type retains its simplicity and fundamental safety while complying with the requirements. I use the word "fundamental" because there will, in future, be two entirely different kinds of flying safety—one of them "natural" and the other bred of scientifically planned regulations which, however advisable for the legal safeguarding of the citizens' rights in life-expectation, may be dodged by an equally scientific and amoral aerodynamicist.

Such has always been the particular disadvantage of all regulations. When a matter is left to an individual's judgment he is in honour bound to respect any unwritten conventions, but as soon as it is tied up in legal phrases the same individual then feels perfectly free to cheat so long as he can keep within the written law. The only rules which are really kept are those of which the great mass of opinion is in favour; unpopularity is usually a far more thorough deterrent than any direct punishment. That is one of the many features of the human character which are being forgotten in this planned world of careful regulations.

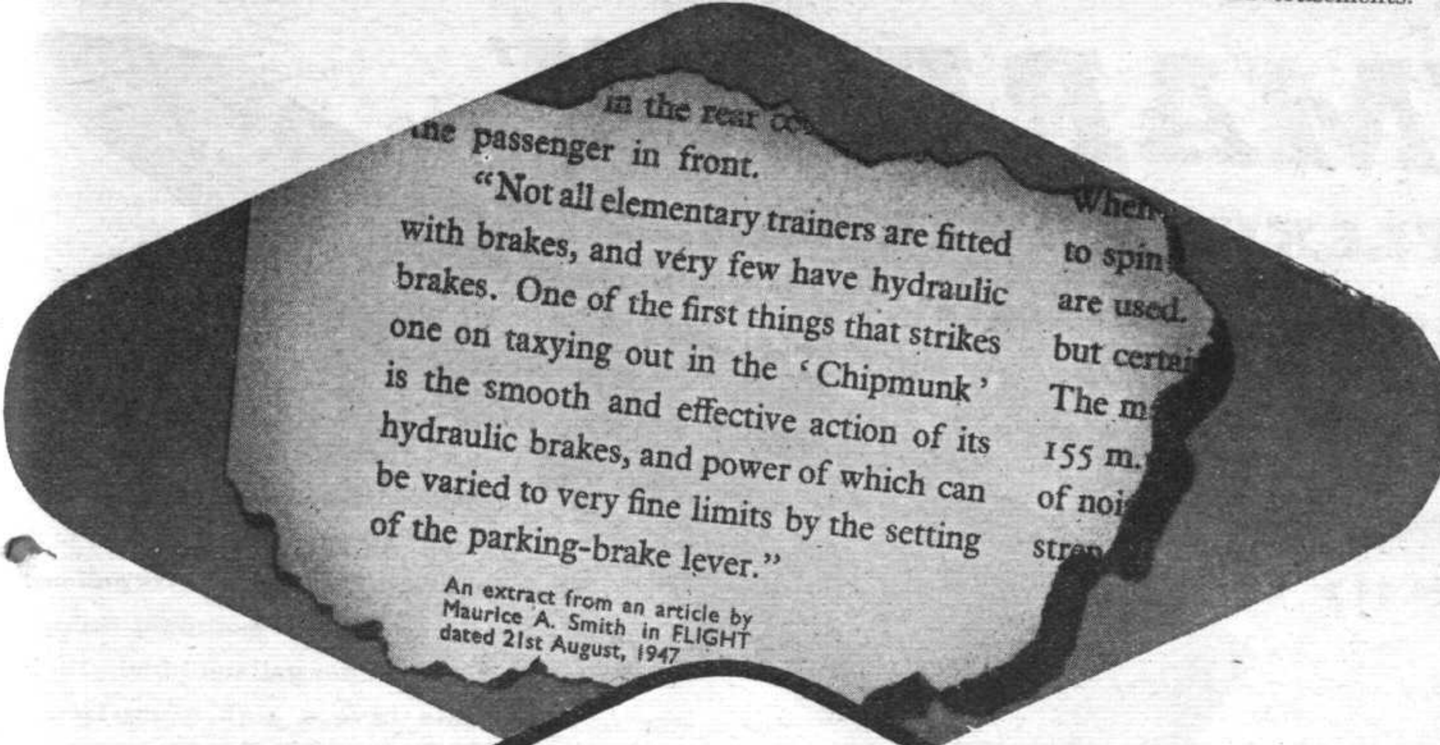
Formulæ-cheating is going to be a very amusing game for all civil aircraft constructors. The majority will abide by the spirit of the rules, but one or two—who may for instance, be finding the engine-failure rate of climb a tough proposition—will discover ways and means of putting their aircraft successfully through the hoop. And such ways and means may not necessarily produce an aircraft which is fundamentally as safe as the pre-modification version would have been.

Ways and Means

One of the more obvious means of formulæ-dodging will be those concerned with a reduction of the particular stalling speed on which a rate-of-climb requirement is based. It might be possible here to introduce new forms of high-lift flap which reduce the stalling speed—and this is all to the good of aircraft design if its use is not accompanied by vicious characteristics in extreme conditions. All too many citizens have already had their necks broken and bodies unceremoniously cremated in aircraft which have tended to fall suddenly off the sharp edge of a lift-curve.

Systems of automatic feathering after power-failure are, one hears, likely to be permitted by the regulations and, if so, will undoubtedly be used. Excellent though such safety devices may be, they all increase the complications of aircraft and thus provide more possibilities of failure. Again, there will be a tendency to bully the engine manufacturers into the issue of still more emergency power. Engine reliability will duly suffer and we shall have a paradoxically curious situation in which, so that the aircraft may be safe when an engine stops, such a stop is almost positively guaranteed.

So far, incidentally, I have not heard the suggestion that J.A.T.O. rockets might be permitted by I.C.A.O. On the face of it, and with no practical experience of the effect of rocket-assistance, I should say that this might be an


in the rear co
the passenger in front.

"Not all elementary trainers are fitted with brakes, and very few have hydraulic brakes. One of the first things that strikes one on taxying out in the 'Chipmunk' is the smooth and effective action of its hydraulic brakes, and power of which can be varied to very fine limits by the setting of the parking-brake lever."

An extract from an article by Maurice A. Smith in FLIGHT dated 21st August, 1947

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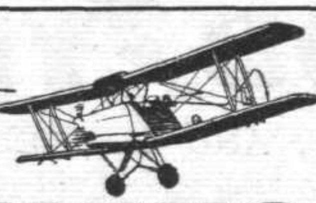

5,040 FLYING HOURS

Bearings Returned to Engine Untouched

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