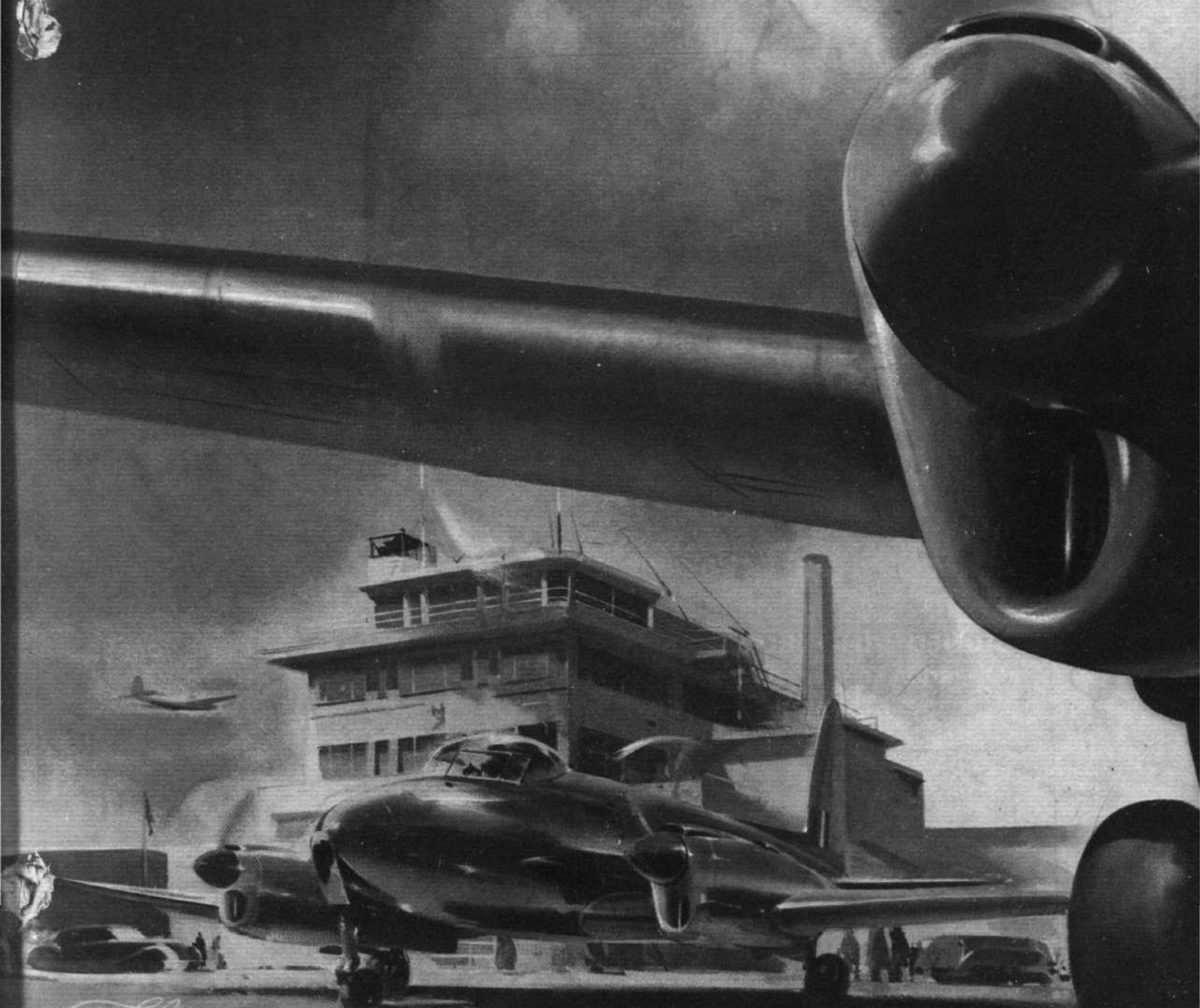


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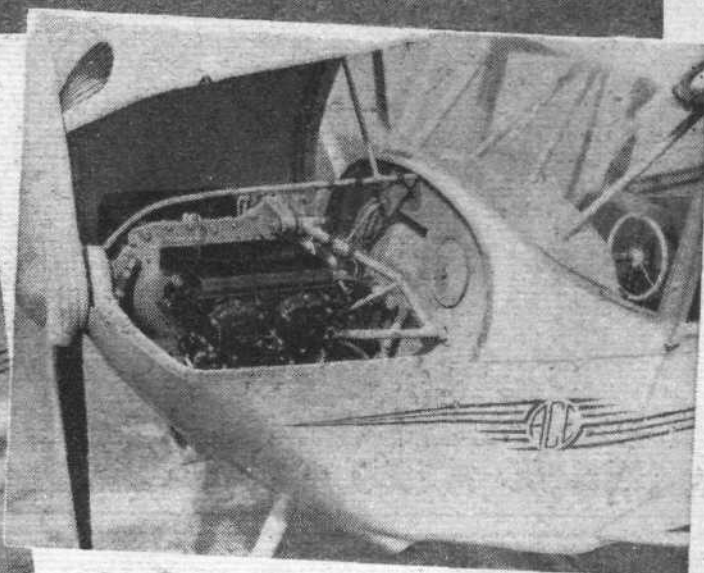
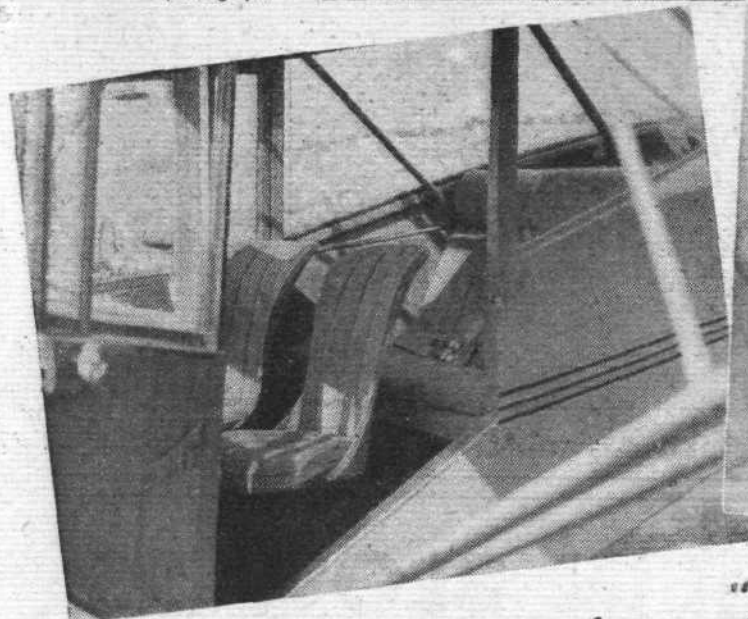
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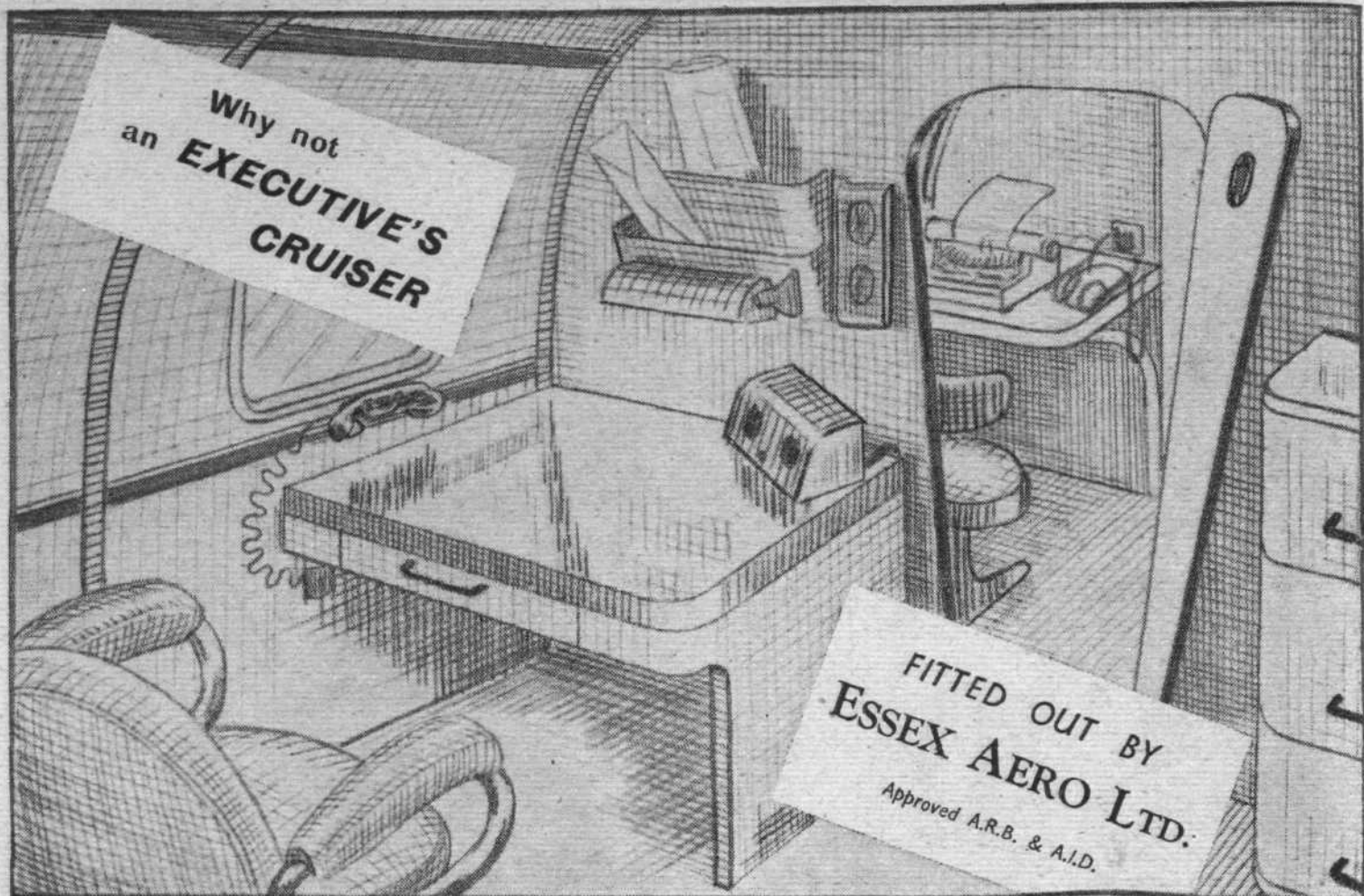
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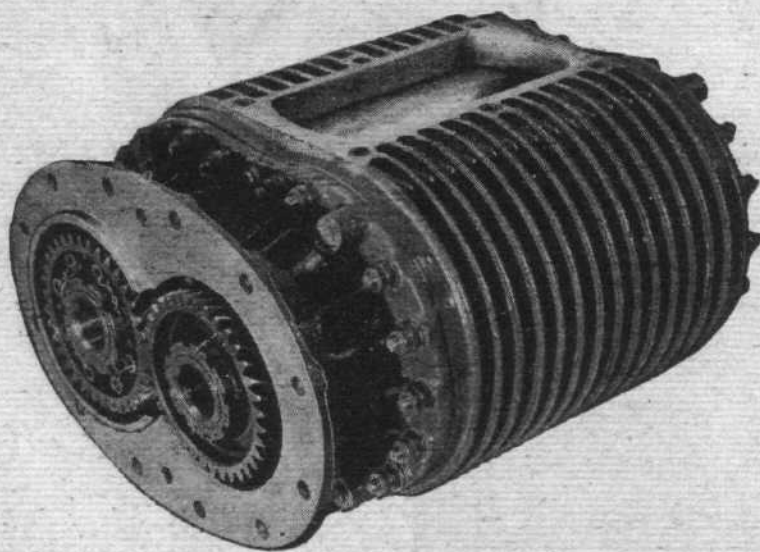
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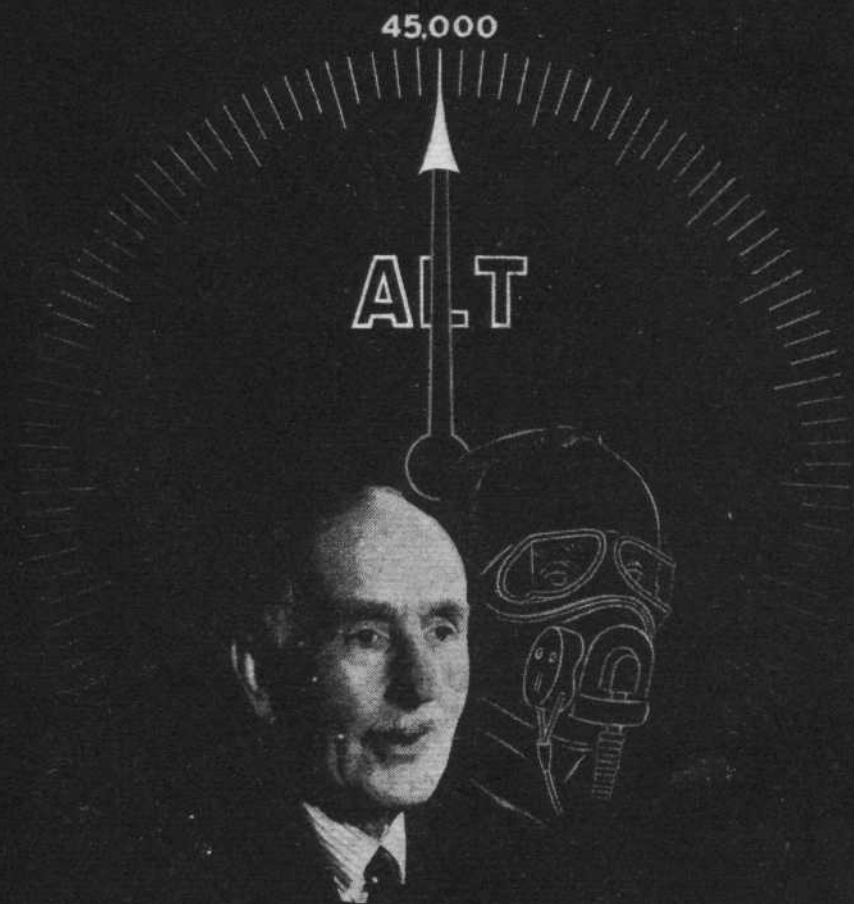


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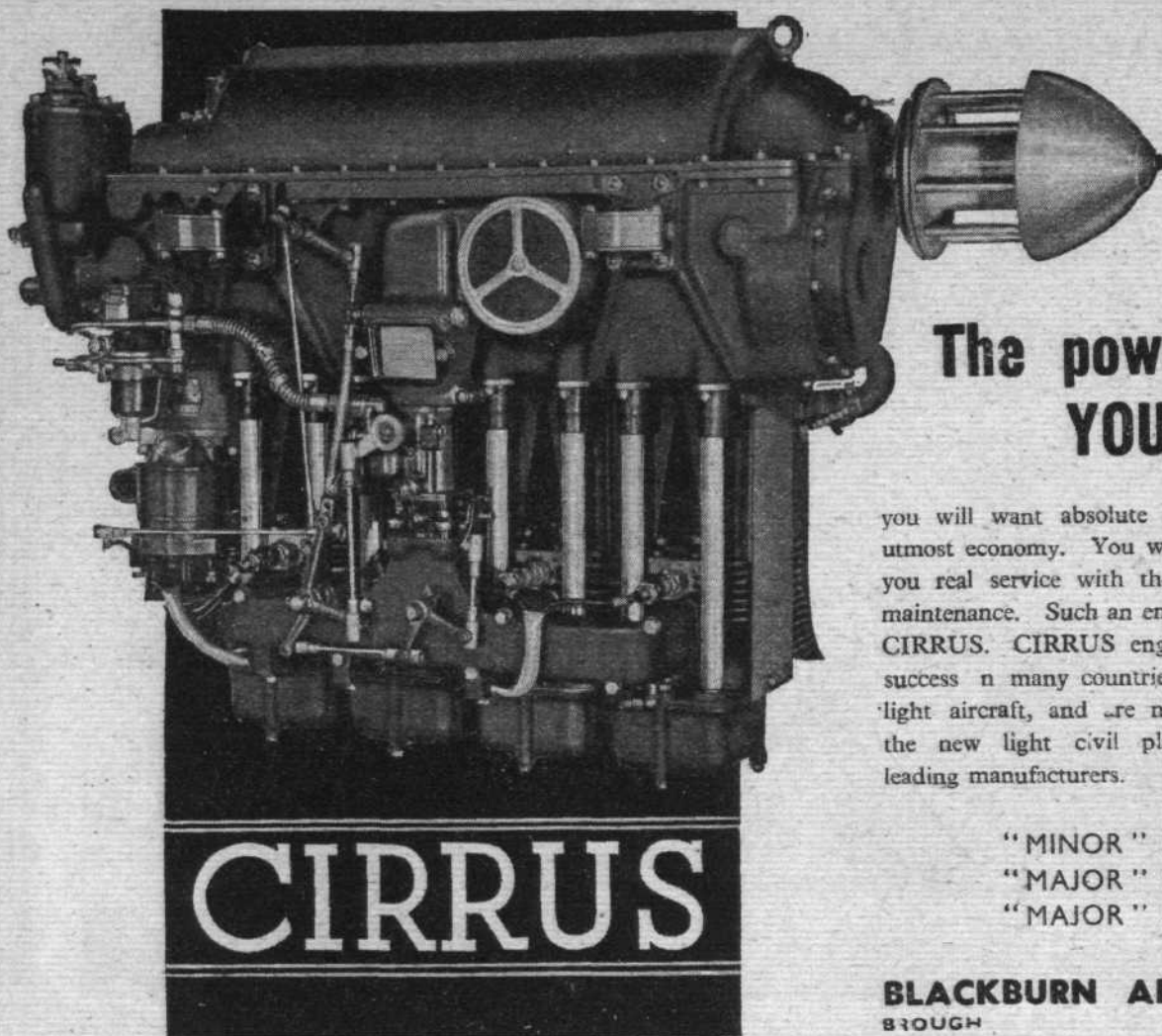
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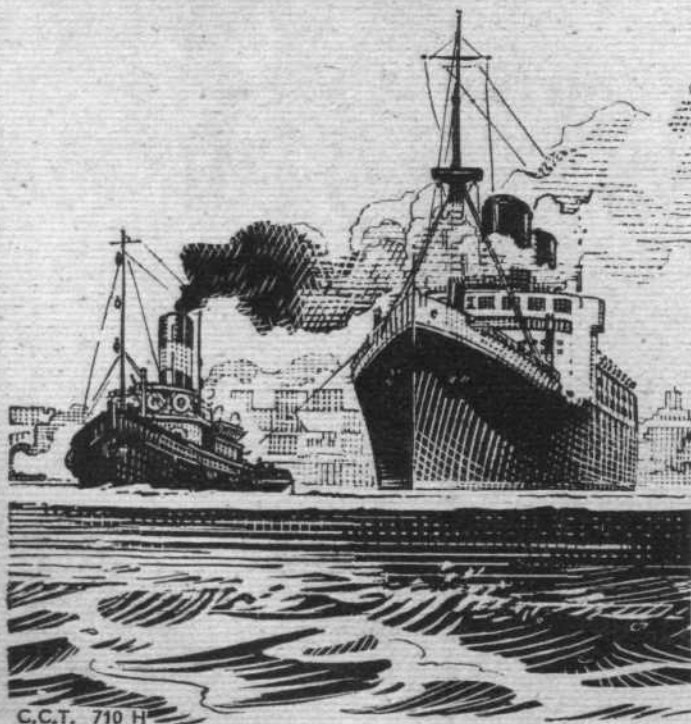
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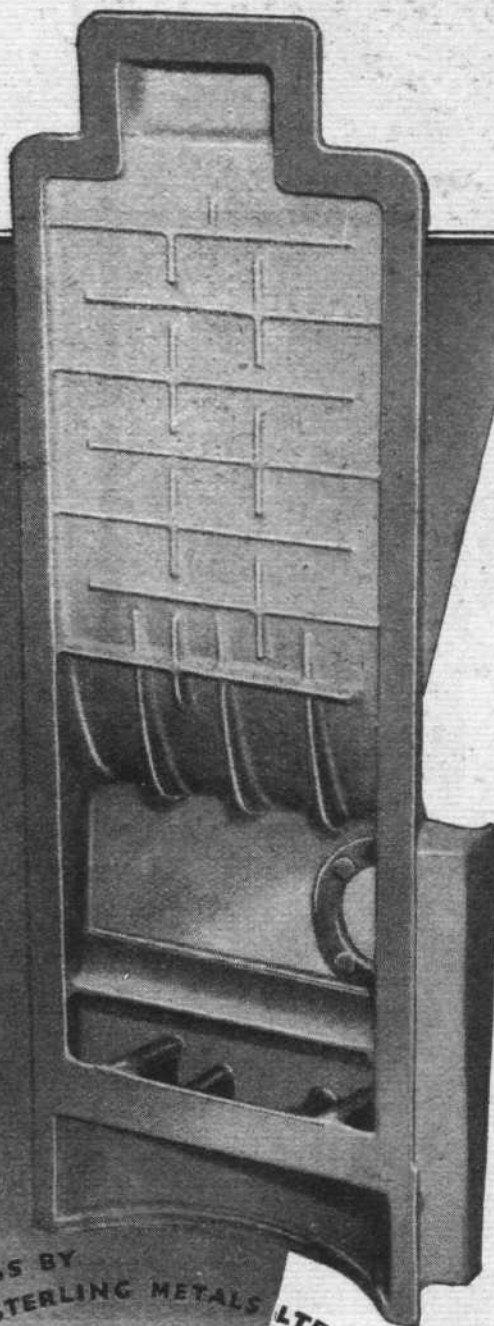
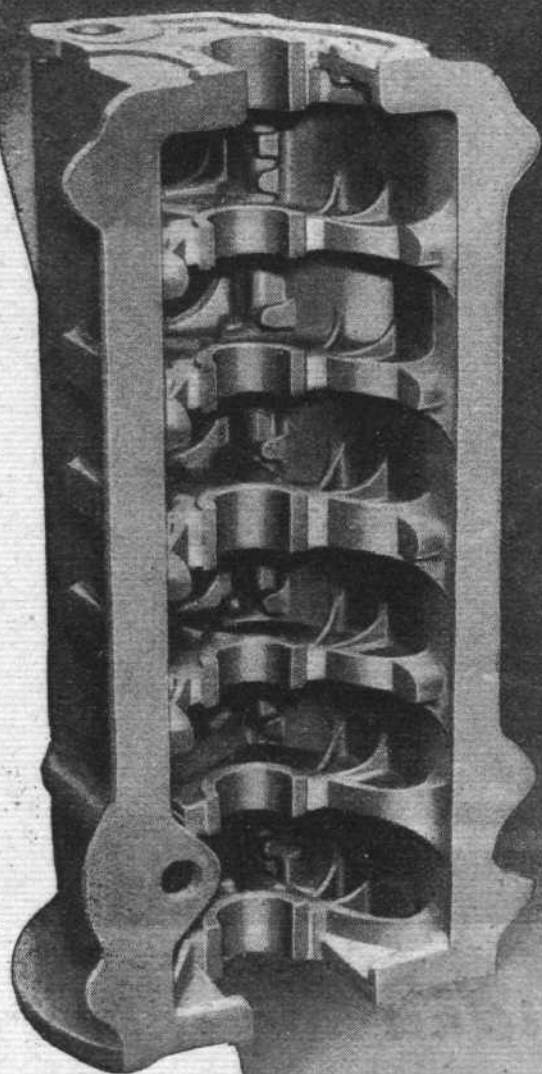
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Thursdays, One Shilling.

The Outlook

Combined Operations

LEARNING from bitter experience the Allies during the war developed the idea and practice of combined operations to an extent which could scarcely have been foreseen, let alone planned, by the Staffs in the years between the two wars. Yet the Combined Operations Command is now faced with the problem of trying to visualize what form combined operations should take in the future. The task is a formidable one for no one can foretell what will be the effect of the new weapons of destruction now being developed, much less of those which may be expected to be beyond the present horizon.

The expression—"beyond the horizon"—may well become actual fact, for there can be no doubt that pilotless projectiles of enormous range will be available to several of the Powers, so that a surprise attack from an unknown base will be an unpleasant possibility.

At the new School of Combined Operations at Fremington, North Devon, where the first five-week course is now being held, the lessons of the war are being digested and, it may be assumed, new combinations of the three fighting services propounded and tried for the benefit of commanders and staff officers of all Services.

That the first course should have the Army preponderating (20 Army officers, ten Naval officers and ten Royal Air Force officers) is understandable enough. "Opposed landings" figured largely in the recent invasion of Europe, and it is logical that they should be taken as the starting point. But the time may well come when the initial attack is made by directed missiles, and when the actual occupation of a country, following such an attack, will be airborne. Thus it appears likely that this proportion of students may well change very considerably at a later stage.

The great thing is that a start has been made and that, in addition to what may be termed the "Staff College of Combined Ops.," the various establishments for prac-

tical training of whole units are to be not only retained but extended.

Cheap Lightness

SO deep-rooted has become the idea that in aircraft one cannot combine very low structure weight with cheapness of production that it comes as something of a surprise—almost an incredulous surprise—to learn that an American firm has succeeded in achieving the apparently impossible.

The little Seabee described in this issue started with the handicap of being an amphibian, a type of aircraft which is comparatively heavy and complicated. Yet, in spite of this, while redesigning the machine for low-cost quantity production, the Republic Aviation Corporation's engineers succeeded in reducing the airframe weight from 1,260 pounds to 1,140 pounds. The saving of 120 pounds may not appear so very startling at first sight, but it should be judged in conjunction with other aspects.

For example, the number of airframe components was brought down from the 1,800 of the prototype to 450, with the result that the man-hours required to build the machine was reduced from 2,500 to 200. When these figures are taken into consideration, the fact that, so far from entailing extra structure weight, there was actually a reduction of almost the equivalent of one passenger, is rather astonishing.

The explanation of how man-hours and consequently cost were reduced in this amazing way is, of course, the very simple one that tooling and jigging were based on a very large output; 40 aircraft per day is the target. That is possible in a country where there is a large home market. In this country, production on such a scale could only be based on the existence of a very large export market, and tooling costs would be so great that, without the strong support of the equivalent of the American home market, any British firm would need a

very long purse, and a great deal of courage, to launch out on such an ambitious programme.

Without wishing to detract in any way from the American achievement, which is a very fine one, we feel that the different circumstances in the two countries should be borne in mind.

The F.A.I. Again ✓

WHEN the *Federation Aeronautique Internationale* meets in London next Tuesday, it will be the first of its conferences to be held since the war, and the fourth to be held in London. The assembly will be on a somewhat reduced scale, only 14 countries being represented out of the present 26 national aero clubs which form the F.A.I. Before the war 39 countries were members, but, of course, Germany and other enemy nations are now debarred.

The F.A.I. will have many problems to discuss, and it is to be hoped that agreement will be reached on such questions as the abolition, or at any rate simplification, of passport formalities, visas, customs and money regulations.

Then there is the question of the international rules which govern world's records. Some of these have been rendered obsolete by the progress made since they were drafted and require drastic revision.

The four-day conference in London will have many difficult questions to settle, but we look forward to a better spirit obtaining than that which has hitherto characterized the Paris Peace Conference.

Another Order Goes to America

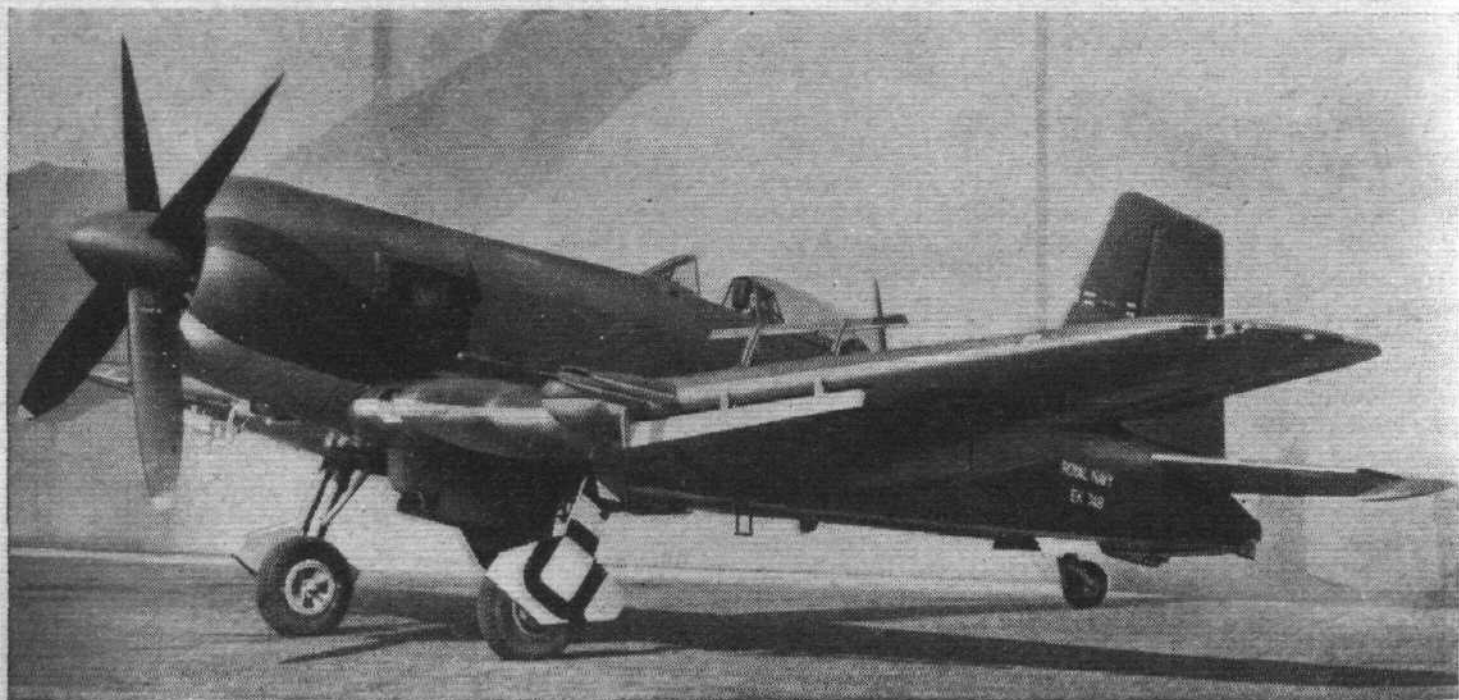
THE announcement by the Ministry of Supply that negotiations have been opened with various firms for the purchase of 200 civil "aircraft of the future," indicates a determination on the part of the Ministry of Civil Aviation to make sure that in the long-term policy Great Britain shall have the most up-to-date flying equipment with which to fight the keen competition that will undoubtedly be encountered.

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Evidently it is not expected that these new types, some of which are of very "advanced" design, will be available for several years, for the Ministry of Supply states that "in addition, as an interim measure designed to maintain a fully competitive service on the New York route during the years 1948-1950, i.e., until the new British transatlantic airliners are ready, an order has been placed in the United States for six Boeing Strato-Cruisers."

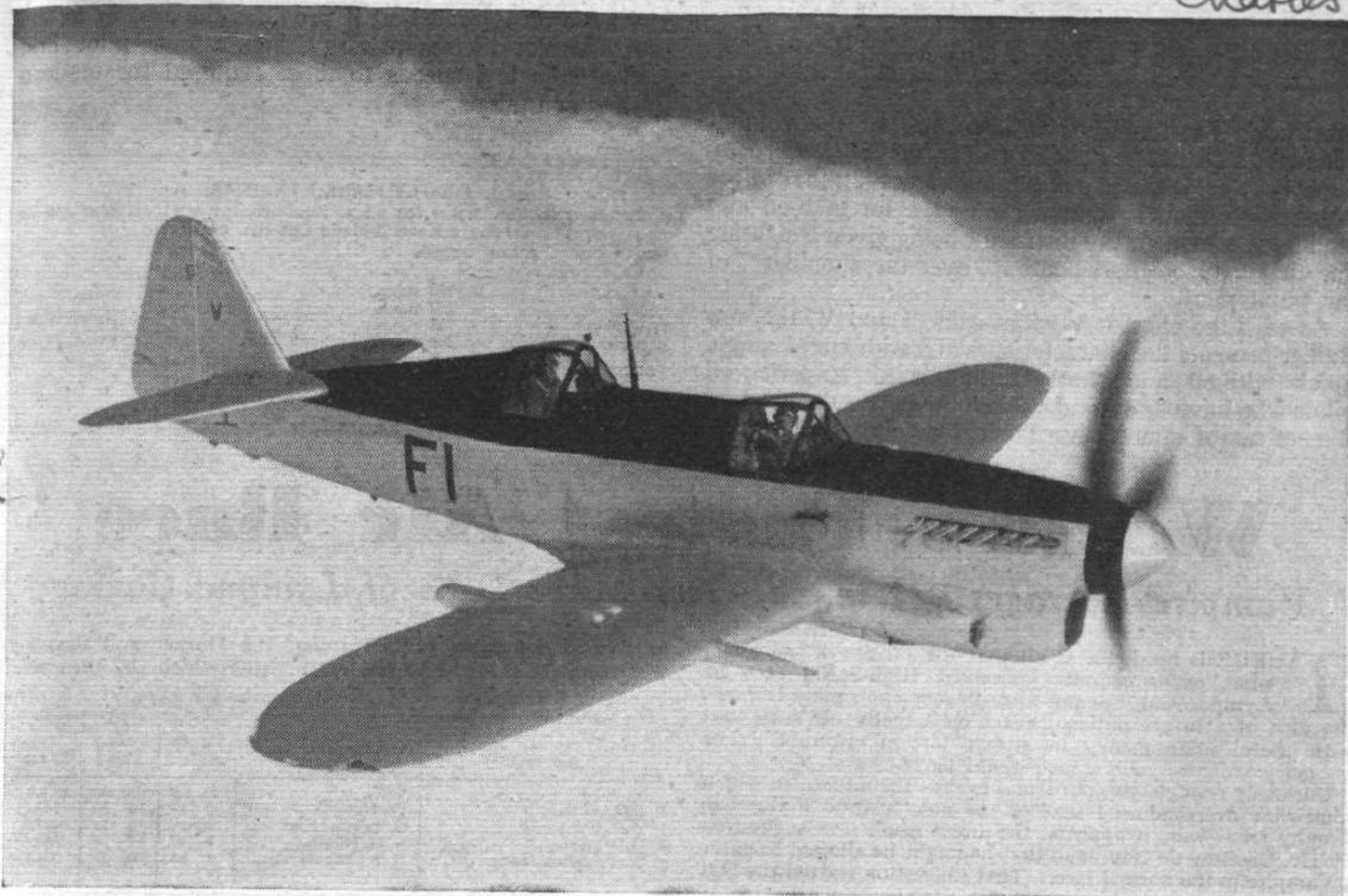
In view of the fact that the American aircraft cannot be expected to be available until some time next year, it is a little difficult to see how the placing of this order can be of very much help in maintaining "a fully competitive service." The Tudor I is due to go on the Atlantic run early next year, but the official announcement states that when the Strato-Cruisers come into operation on the North Atlantic run the Tudors will remain on the Canadian service. That appears to be a somewhat round-about way of saying that the Tudor I is not really suitable for the New York route. It would be interesting to be told officially why there has been this change of outlook.



FOR SEABORNE ASSAULT: Units of the Air Arm of the Royal Navy are re-equipping with highly efficient carrier-borne monoplanes for a variety of duties. Of these aircraft one of the most important and interesting is the single-seat Blackburn Firebrand Mark IV with Bristol Centaurus IX engine delivering 2,500 h.p. for take-off to a four-bladed Rotol airscrew. This new view of a production Firebrand IV shows the leading-edge dive brakes used for dive bombing and torpedo attacks, which limit the speed to 370 m.p.h. After releasing its torpedo the Firebrand can attain 342 m.p.h. at 12,500 ft.

Blackburn a/c Co.

5. SEP 1946



Prototype of the Firefly Mk. I Trainer showing attractive layout. The instructor's view from the rear cockpit is excellent, even for landing.

Firefly Trainer

Dual-Pilot Version of Famous Fleet Fighter Developed for Advanced Training

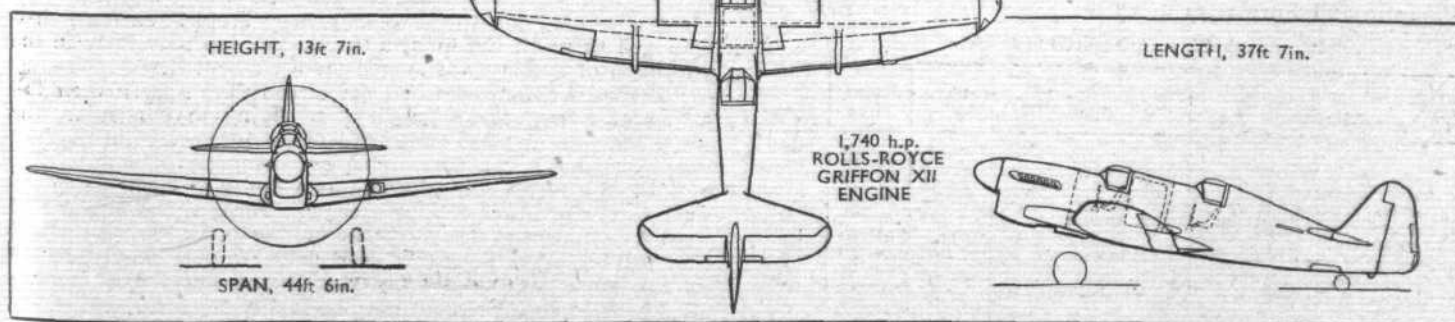
ALTHOUGH there has been a steady and progressive increase in the speeds of first-line operational aircraft, there has not been any comparable increase in the performance of training aircraft, and, as a result, the gap between the two categories has steadily widened. This gap is not only a function of speed, it is also considerably influenced by general all-round performance, handling qualities and modern "drill."

To bridge the gap and to facilitate numerous aspects of squadron tactical training the Fairey Aviation Company have produced a new, trainer, version of the Firefly Mk. I reconnaissance fighter. The prototype of the new version has already undergone successful flight trials, both at

Ringway and Heston. It offers the means to assess the flying ability of newly joined pilots and to ease the transition difficulties of comparatively inexperienced pilots who are unaccustomed to powerful engines and flight speeds 200 miles per hour in excess of those of the types on which they have been trained.

Inherent Characteristics Unchanged

The Firefly Trainer is substantially the same aircraft as the famous Fleet fighter which saw combat service with the Royal Navy from Norway to Tokyo Bay—over which it was the first British aircraft to fly. As may be seen from the photograph, a second pilot's seat with controls has been



FIREFLY TRAINER

substituted for the observer's cockpit of the combat version. The rear seat, which is normally occupied by the instructor, is raised some 12in higher than that of the front pilot's seat, so that a clear view for take-off and landing is obtained, the instructor being given a sighting line that may be described as "over the shoulder" of the pupil pilot.

As with the combat versions Mk. I and V, the new trainer presents the characteristics of a wide speed range, quick take-off and short landing run. Experienced pilots who have flown and studied the new trainer regard it as of major interest in a tactical training programme,

and have recognized that it provides the answer to the psychological factors arising when a new pilot first passes from low speeds to those required for modern combat conditions.

FIREFLY MARK I TRAINER

Rolls-Royce Griffon XII 1,740 b.h.p. liquid-cooled V-12 cylinder engine driving a Rotol 3-blade 13ft. dia. airscrew.

All-up weight - - - - - 12,000 lb

Speeds :-		Climb :-	
Sea level	283 m.p.h.	5,000ft.	2 min. 35 sec.
1,500ft.	287 m.p.h.	10,000ft.	5 min. 45 sec.
16,000ft.	305 m.p.h.	15,000ft.	9 min. 30 sec.
20,000ft.	300 m.p.h.		
Take-off in 27kt. head-wind		350 feet	
Service ceiling		28,000 feet	
Range at 5,000ft.		800 miles	

World's Fastest Air Race

Vampire Averages 427 m.p.h. Over Three Laps of Lympne Course

THERE is no doubt at all that the success of the somewhat experimentally conceived High-Speed race at Lympne last Sunday turned every one's mind towards the idea of a future national event on a really big scale and with useful prize money to attract foreign entrants. The publicity value of such a race would be immense.

Curiously enough, this particular event—the interest in which somewhat overshadowed that of the now historic Folkestone Trophy race—was, it appears, the direct result of a suggestion by Mr. Geoffrey de Havilland that he might be allowed to enter a Vampire in the normal race. That suggestion started the ball rolling and, surprisingly enough, the various Ministries raised no objections. For the purpose of the race the aircraft concerned were "bought back" and insured by the manufacturers concerned, and became for the purpose civil aircraft *pro tem*. Interestingly enough, both Mr. de Havilland and Mr. Humble had been keen supporters of air racing in pre-war days.

Handicapping such very fast and widely differing types can have been no easy matter, and the fact that all four aircraft arrived within 35 seconds of one another was a very good effort by Messrs. Dancy and Rowarth, who, once again, are back together on this tricky and distinctly thankless task. Incidentally—for the benefit of those readers who, having learnt to think in terms of very high speeds, might be disappointed by the "low" figures recorded—it must be stressed that these speeds include the time taken to accelerate from a standstill, get on to course and to make a total of twelve high-speed turns in the course of three laps. Furthermore, the distance figure on which the speeds are based bears little relation to that actually covered. To those knowledgeable in such matters, the recorded speeds must appear to be very high.

As a spectacle the race was immensely exciting, with the field closing up steadily to the moment when the Vampire took the lead on the last lap. In contrast to the necessarily somewhat slow Folkestone Trophy race, the effect was electrifying, and it was only a pity that the first and second places should have needed revision following an accident in starting which was nobody's fault. The slipstream from the accelerating Hornet blew the timekeeper's watch-board over his head at the critical moment, and the Vampire was flagged away early. Although the incident must have appeared as a very serious matter to those concerned in judging and timing, it really did not affect the success of the event.

From the flying technique viewpoint it was interesting to watch two divergent turning systems at Lympne. While the Vampire and Fury were flown off course towards the turn, so

as to cut the point while turning, the Hornet and Seafang were brought straight to the mark, from which the turn was

LYMPNE HIGH-SPEED HANDICAP RACE

Aircraft	Pilot	H'cap All'ce	Flying Time	Speed
1. Hawker Fury I	W. Humble	min. sec.	min. sec.	m.p.h.
2. D.H. Vampire I	G. de Havilland	2 14	10 22	342.0
3. D.H. Hornet I	G. H. Pike	Scr.*	8 19	427.0
4. Supermarine Seafang 32	M. J. Lithgow	1 47	10 18	343.5
		1 56	10 39	332.0

* Estimated after starting error.

then started. In appearance, at least, the first method seemed to be the more economical one. But the handling of all four was a joy to watch.

After the heats of the Folkestone Trophy race, which had been flown off in gusty conditions on Saturday, the final result, to anyone with a calculating turn of mind, must have seemed almost a foregone conclusion—and especially so if the wind dropped. And this, in fact, it did, so that, over a closed circuit and using the same handicapping allowances, the slower aircraft were bound to show better average speeds. Mr. Grierson's Walrus, already tipped to win, took the lead from the limit man's Messenger during the first lap and increased it steadily, while both aircraft were nearly a minute ahead of the gaggle of Proctors, the Gull and the single foreign entrant—

SIDDELEY CHALLENGE TROPHY RACE

Aircraft	Pilot	H'cap All'ce	Flying Time	Speed
1. D.H. Tiger Moth	R. Pomfret	min. sec.	min. sec.	m.p.h.
2. Miles Hawk II	R. Paine	5 25	23 51	102.0
		Scr.	18 48	129.2

a Mraz Sokol, which suffered jet trouble on the last lap and limped home from Folkestone to be out of the race—all of which crossed the line under a handkerchief of not much more than a minute in a half-hour's racing. Even the scratch man, with the Gull Six, only managed to pull himself up from ninth to fifth place. And if anyone doubts the truth of the statement about average speeds, it is worth noting that, whereas the Walrus averaged 114.5 m.p.h. on Saturday and 121 m.p.h. on Sunday, and the Messenger 108.75 and 116 m.p.h. respectively, the Proctors' speed increased only 2 to 3 m.p.h.

Since neither of the two Siddeley Trophy entrants had managed to reach the final, a special two-lap race early in the afternoon of Sunday was staged for their benefit.

For those visitors who had not already been given their full ration of flying, and of high-speed flying in particular, the afternoon was rounded off with demonstrations—quite the best we have seen—by all four high-speed competitors.

Both as a series of events and as a flying social occasion the week-end was a tremendous success. Perhaps the Minister of Civil Aviation, who presented the various prizes, noted the fact that private flying is neither dead nor even very poorly, for all its Cinderella situation. And the Cinque Ports Club, among all other people concerned, is to be loudly congratulated.

FOLKESTONE AERO TROPHY RACE (Final)

Aircraft	Pilot	H'cap All'ce	Flying Time	Speed
1. Supermarine Walrus	J. Grierson	min. sec.	min. sec.	m.p.h.
2. Miles Messenger	H. C. Kennard	7 14	29 14	121.0
3. Percival Proctor I	J. F. Arnold	7 44	30 34	116.0
4. Percival Proctor I	G. A. Reston	34	24 06	147.0
5. Percival Gull	L. T. Carruthers	34	24 33	144.25
6. Percival Proctor I	J. N. Somers	Scr.	24 08	146.75
7. Percival Proctor I	D. M. Bay	48	24 59	141.5
8. Percival Proctor II	R. Temple-Harris	34	24 48	142.75
		43	25 16	140.25

The Goofers' Platform

By Pyfo

*"They gave me a Seafire to beat up the Fleet;
I polished off Nelson and Rodney a treat;
Forgot about the masts that stuck up on 'Formid,'
And a seat in the 'Goofers' was worth twenty quid."*

AT the after end of the island superstructure of our large fleet carriers of the *Illustrious* class there is a clear bit of deck where, by some oversight, My Lords have omitted to put some gun or other warlike implement. This is known as "The Goofers' Platform" or "The Goofers." A goofer in Naval slang—or anyone's slang for that matter—is a person who stands gazing at some incident in which he is not actively concerned. This platform was where we—for all Naval Air Arm types are ardent goofers—forgathered to watch other poor characters landing.

It was almost as popular a shop-talking place as the wardroom bar. There the new boy or sprog could hear how "In '42 old Pranger Poodle landed on his carrier's sister ship and had sunk his second gin before realising it." He can hear every type of aircraft discussed, its good and bad points, in a queer jargon of revs., boost, wing loading, etc., which a layman would find it hard to understand. He can hear the past, present and sometimes the future of other members of the Naval Air Branch. Spend enough time on the "Goofers" and you will get a pretty thorough history of the "Branch," for we are a fairly small service and you eventually get to know, or know of, most of the characters.

It is a spot by common consent sacred to aircrew, although other types are welcomed, provided they are willing to listen to an argument on the relative merits of the Seafire and Corsair, or to an eulogy on the Stringbag. Although it was cursed in its day by pilots freezing on an anti-submarine patrol, and by observers trying to hold on to chartboards whilst grovelling for lost pencils, now that it is passing into antiquity the Swordfish is regarded with more affection than ever before lavished on an inanimate object. Perhaps "inanimate" is the wrong word to use about an aircraft.

The "Goofers" is a favourite sun-bathing spot. In warmer climes its rails are draped with bodies varying from virgin white, through lobster pink to the much-envied brown; rig of the day being socks rolled down and shorts rolled up.

Twitch-making Business

The main object of the types who frequent the "Goofers" is, of course, to watch the landings. This can be a much more twitch-making business than actually landing yourself. I know one observer who will sit quite happily in the back of an aircraft landing-on, yet will never watch a landing if he can help it—queer type no doubt, but it is understandable. Each and every landing is closely watched and criticized. A running commentary usually accompanies it . . .

"He's too ruddy fast. . . . Get your nose up, man. . . . What the hell is Bats playing at. . . . He'll have to go round again. . . . Oh, lovely landing. . . . Ruddy good Batsman, old Sandy. Don't tell him I said so—we had an argument about how to bring-in a Firefly yesterday."

It is like watching a cricket match. We could all have played the stroke better than the man at the crease.

There is a saying that any landing is a good one if you can walk away from it. Most Batsmen have never heard these words of wisdom, or if they have they don't subscribe to the theory. You may be chucking your Mae West into your locker, or even have got as far as settling yourself behind a beer or magazine, according to taste, when he will accost you with "What the devil were you playing at today. Go up ruddy well means go up. I don't dance around in that wind for fun. Have a drink."

The most common crash on an aircraft carrier is a "barrier prang." The barrier is a stout steel wire mesh which can be raised across the flight deck about the island. Its purpose in life is to stop aircraft which have missed all the arrestor wires charging up the deck and crashing into aircraft parked forward. It is a very lucky and a skilful pilot who gets through his career without once hitting the barrier. With the landing area, about eighty by three or four hundred feet, often rolling, pitching and indulging in all the cantrips of a ship at sea, this is hardly surprising. The Perch Club—one hundred landings without a prang—is a very exclusive club indeed. A barrier prang is not very serious except, of course, for the fact that a valuable aircraft is out of action for the rest of the trip. The pilot, unless he has disobeyed the batsman or done something stupid, is seldom blamed and invariably gets away unhurt.

Prangs from the Stalls

The "Goofers" commands a very fine view of these prangs, being almost directly above the after barrier. The first thing the unfortunate pilot sees on stepping from his bedraggled aircraft is a row of his chums' faces peering down with gloating expressions—another member of the Barrier Club.

Some very fine bits of flying have been witnessed from the "Goofers." There are, to my mind, few finer sights than a squadron flying down the starboard side in nice tight formation, breaking-up and landing-on at regular 20- to 30-second intervals. From the "Goofers" we have watched aircraft coming back to land-on with pieces of wings and control surfaces missing, ropy engines, and windscreens covered with oil, yet still making perfect landings. There was the case of a Fulmar with one leg stuck up and the other down, landing with so little damage that it was flown-off next day. One of our escort carriers was torpedoed and listing badly, yet anti-submarine patrols were flown-off and flown-on, keeping the subs down and enabling the carrier to limp home.

Goofing isn't quite so easy in an escort carrier. There you have no platform, and goofing must be done from the cat walks along the sides of the flight deck. It is just as well to keep one eye on your means of retreat, since aircraft have been known to put a wheel in the cat walk, and it is better not to stay to argue with them.

It takes a lot to shift a confirmed group of goofers, but they have been known to scatter. It was in the Med., a Fulmar was on its final approach, when for some reason one of the starboard guns started firing. It was each man for himself and the "De'il tak the hinnermost." I can vouch for this. I led the rush.

For many of us, goofing days are over, and the peace and quiet of civilian life awaits us. That is, if dodging London traffic and wearing shoes thin to find somewhere to park yourself and family, is peaceful. The yarn-spinning and line-shooting is transferred to odd meetings in pubs and such like places. But the Navy has its peacetime job to do, and the goofers will be kept warm.

Perhaps some quiet summer evening a stratospheric, jet-propelled aircraft pilot, having his last breath of fresh air before turning in, will look up and see the rails once more draped with shadowy figures wearing thin wavy stripes on their sleeves. If he goes nearer he may hear snatches of conversation: "It was in the *Argus* in '41. . . ." "'Tis a blooming old Stringbag. . . ." "Second wire every time, old boy. . . ." "He was in the *Indom.* with me. . . ."

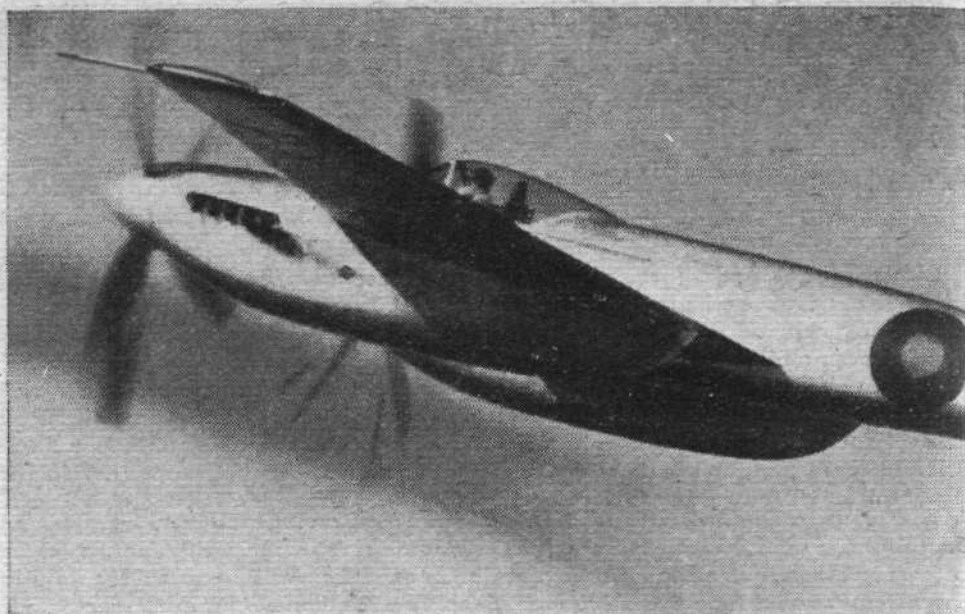
If he is a good type, he will go below and leave them in peace.

5 SEP 1946

SEPTEMBER 5TH, 1946

HERE AND THERE

CAMERA CURIOSITY: Chief interest in this photograph of a Hornet is the weird effect of the focal-plane shutter on its airscrews, and one might speculate on the possible results on "handed" airscrews. The oblique shadow in the foreground is of a blade of the Mosquito from which the picture was taken.



Live-Stock by Air ✓

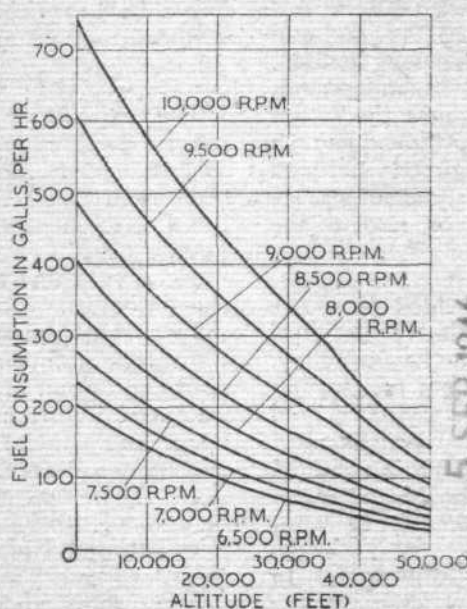
AUSTRALIAN cargo aircraft are being increasingly used to move valuable or much-needed animals over comparatively long distances in that part of the world.

Qantas recently flew three Alsatian pups and a Scotch Terrier pup, valued at £80, from the Commonwealth to Singapore, and regular shipments of pups into Malaya are to follow because dogs seem largely to have disappeared during the Jap occupation.

"Grand Slam" on Tour ✓

THOUSANDS of Britons living between London and Newport (Mon) saw, for the first time last week, the war's biggest bomb—the famous 22,000 lb "Grand Slam"—an example of which on a 53ft trailer, headed the R.A.F. convoy of 12 vehicles which left London to take part in the Motor Jubilee Rally at Cardiff and other centres.

Other outsize R.A.F. vehicles in the convoy were a 2,500-gall. petrol tender used for refuelling bombers, a mobile land-mark beacon which flashed code



GHOSTLY CONSUMPTION: These curves illustrate the fuel consumption at 500 m.p.h. of the de Havilland Ghost.

letters at night that were recognizable by pilots 30 miles away, and the fuselage of a R.P. Typhoon on a "Queen Mary" trailer.

During the run to Wales the convoy made halts at various towns for recruiting purposes.

Pleasant Prospects! ✓

DR. J. T. LOWE, an air expert in the U.S. Department of War, evidently does not think much of the world's hope for future peace, for in an article in a new publication called *Air Affairs* he proclaims that in the "foreseeable future" entire armies will be transported by rocket-driven troop-carriers to occupy a country (he doesn't say which!) momentarily stunned by attacks from atom bombs. Such "rocket ships," he explains, will streak through the stratosphere at 100,000 m.p.h.

But he says that so long as the U.S. controls the air space above her territory she will not be on the receiver end of atom bombs and cannot be defeated.

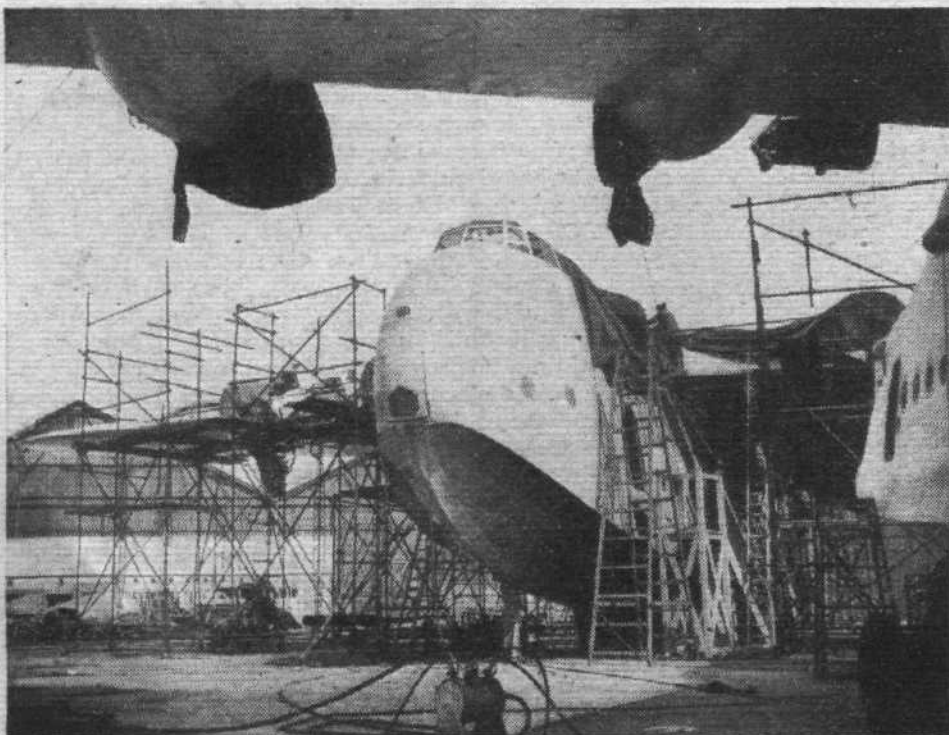
So apparently he has no faith in the ultimate development of the V.L.R. rocket with an atom bomb neatly stowed in the business end!

Home Again ✓

LAST Thursday the Lancasters of No. 35 (Madras) Squadron returned to their base at Graveley, Hunts, after their 15,000 mile "goodwill tour" of America.

They flew in formation over South Coast towns and London, and were officially welcomed at their base by Lord Henderson, representing the Secretary of State for Air; Air Marshal Sir Norman Bottomley, A.O.C.-in-C. Bomber Command; Sir William Brown, Permanent Under-Secretary of State, Air Ministry; Mr. Cabot Coville, First Secretary of the U.S. Embassy; and other high-ranking officers and officials.

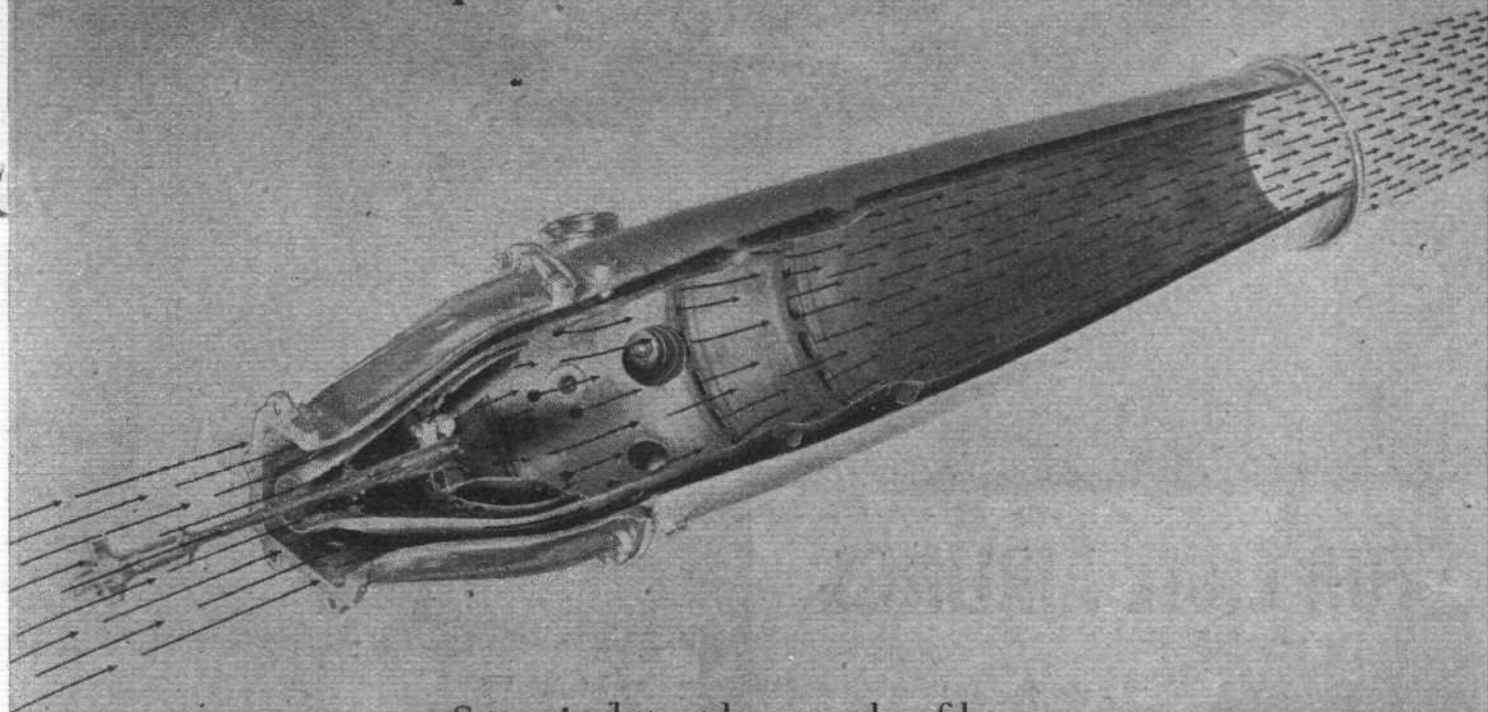
Addressing the assembled air and ground crews, Sir Norman Bottomley said that the goodwill mission had



ON THE STOCKS: This view of the second Short Shetland flying boat nearing completion at Rochester gives a good idea of its impressive size. The first Shetland was accidentally destroyed by fire at its moorings.



Complete combustion



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Thorough mixing

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Robust construction

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HANDLEY PAGE

HANDLEY PAGE LIMITED, LONDON, ENGLAND

5 SEP 1946

P. A. - Reuter 239

HERE AND THERE

marked the close association of their two countries and the spirit of comradeship which had united our arms throughout the war. "The reputation of the R.A.F. was very safely left in your hands," he said.

"Theirs is the Glory"

A FILM with the above title, telling the story of Arnhem, is to have a simultaneous premiere in London, Arnhem and Ottawa, and will be released in 60 British towns on Tuesday, September 17th, the second anniversary of the famous battle.

Very fittingly, no credits are being given to the individuals who have made this film, which has no professional actors; the only credit is to the men of the 1st Airborne Division who have re-enacted the epic struggle.

A special performance in aid of the Airborne Forces' Security Fund is to be given at the Gaumont, Haymarket, at 7.30 p.m. on September 17th.



WALKING AWAY WITH IT. *Flight* does not often publish pictures of crashes, but not every day can a pilot escape uninjured from such a complete "write-off" as this Meteor. The lucky man was W/O F. V. Ryan.

News in Brief

HAVING lowered the England-Australia-New Zealand record, the Lancaster, *Aries*, was scheduled to leave New Zealand for the Fiji Islands yesterday (after *Flight* had gone to press) and to fly on to Sydney to-morrow.

It is hoped, within the next three months, to move the aviation activities of the Royal Aero Club from 119, Piccadilly to Londonderry House, Park Lane, and to establish the new associate members at headquarters there.

Brentford and Chiswick Model Flying Club is to hold its annual Gala Day on Hounslow Heath on Sunday next, September 8th. Prizes in the various contests are to the total value of £30.

The Glasgow branch of the R.Ae.S. is holding its first meeting of the season at Prestwick Airport on Thursday, September 26th, at 7.30 p.m. It will take the form of 15min "lecturettes" by any members previously notifying the secretary of their desire to contribute.

According to the British United Press, ten U.S.A.A.F. Mitchell bombers in flying trim have been handed over to the Chinese-owned Central Air Transport Corps by the local office of the U.S. Liquidation Commission. This, says the Shanghai message, is "in apparent direct contravention of U.S. federal regulations."

The P-80 which some weeks ago flew from Long Beach to New York in the record time of 4hr 13min (with the help of tail winds of well over 100 m.p.h.) has now flown from New York to Boston, a distance of 175 miles, in 21min 50sec—an average of slightly over 558 m.p.h. Wind conditions were not stated.

Howard Hughes, the American millionaire pilot, who was seriously injured some weeks ago when an aircraft he was flying crashed into a house, was reported recently to be out of hospital and staying with friends in Hollywood. But he will still have to spend most of his time in bed for several more weeks.

Mr. Norman R. A. Biles has resigned from his position as publicity manager with Blackburn Aircraft, Ltd., to take up a post in a similar capacity with John Fowler & Co. (Leeds), Ltd. He is succeeded at Brough by Mr. Clifford Hollowell who was formerly with Fairey Aviation Co., Ltd.

The Falkirk Rolling Mills, designed and operated for the Government during the war by the British Aluminium Co., Ltd., have now been acquired by them for commercial purposes. In addition to heat-treated alloys for aircraft, the mills will produce sheet and coiled strip aluminium for many other purposes.

For some years there has been a British Standard specification for synthetic resin moulding powders of the

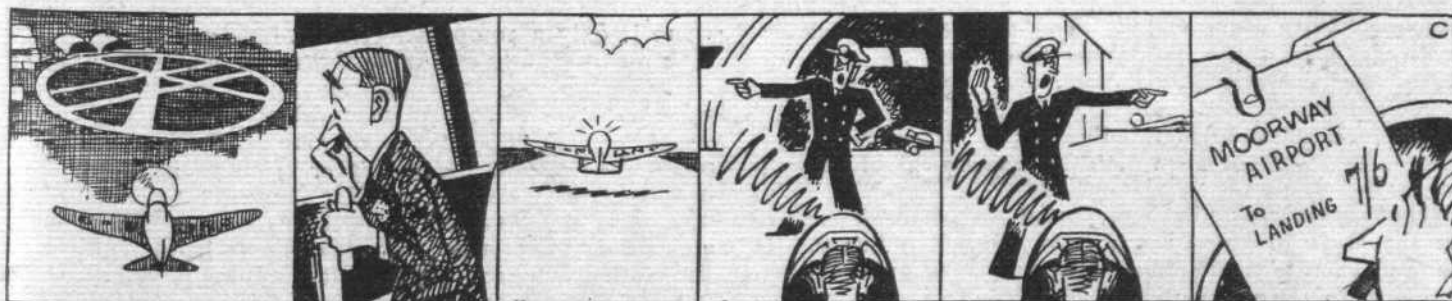
phenol formaldehyde type. A corresponding specification for the amino-plastic (urea) materials has now been issued by the British Standards Institute. This specification (B.S.1322:1946) defines two types of materials according to their properties, and further types will be added later. Copies may be had from the B.S.I. Publications Dept., 28, Victoria Street, S.W.1, price 2s.

Three U.S. dive-bombers, practising over Lake Erie, mistook a cabin cruiser for their target vessel and scored a direct hit on it. The cruiser was completely burnt out and the owner, rescued by a fishing boat, is in hospital suffering from shock and minor injuries. The real target vessel was seven miles away!

Outlining a number of defects in the present radar equipment, Capt. Sam Saint, manager of American Airlines' development section, says that radar in its present form cannot be relied upon too heavily for airline navigation. As the image on the screen of the search-type radar is not three-dimensional, there is the danger of a ridge being mistaken for a river and a hill for a lake.

The Cowper factory at Olney has been acquired by Lodge Plugs, Ltd., to augment the output of their Rugby works for the home and export markets. Additional plant is to be installed in the Olney works, which the company operated during the war as a shadow factory for M.A.P.

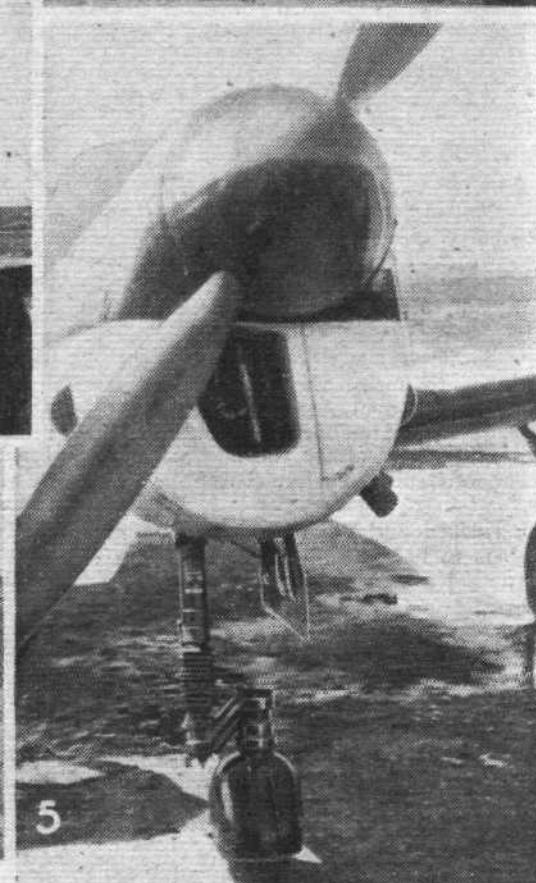
AIRSTRIIP . . . No. 30



5 SEP 1946

Private Flying in France

The Position of the Industry and the Clubs : Plenty of Enthusiasm :
Echoes of the Toussus
Exhibition



1. The Renault-engined S.N.C.A.N. Nord 1101. 2. The S.E. 2310 which is powered by a Renault Bengali engine of 140 h.p.
3. Marcel Dorét, the well-known French pilot, about to fly the S.E. 2300. 4. The Nord 1201 "Norecin." It has steps built into the root of the trailing-edge flap. 5. Nosewheel and engine installation of the Nord 1101, Noralpha.

A FEW months ago M. Tillon, the French Ministère de l'Armement, when lifting the ban on private flying, boldly announced that all Frenchmen were now free to fly. The inevitable cry arose from the thousands of enthusiastic men and women: "What in? Where? With what fuel?" The exhibition at Toussus-le-Noble, held during the Easter holidays, was intended to provide the answer to the first part of the plaint; the second question is rapidly being cleared up; but the answer to the last is still shrouded in mystery.

The Toussus exhibition presented a pretty fair picture of the state of the French light aircraft industry. It showed what a tremendous effort has been, and is being, made to produce "popular" aircraft. However, judging

by the comments made by club members and prospective and pre-war private owners, I cannot help feeling that the effort has been largely misdirected. It seems to me that, because of the very high prices charged, much time and money has been spent on producing aircraft for which there is only a comparatively small market.

For instance, the winning design of the Marignanne competition, the Nord 1201, which is going into quantity production, costs approximately one million francs, and its bigger brother, the Nord 1101, is priced at over 2½ million francs. Several other machines, also constructed by the nationalized companies, are priced at over a million. It can only be imagined that these otherwise excellent aircraft are being produced solely for the charter operators, *nouveaux riches* and successful

By Ian A. Forbes

15 SEP 1946

black marketeers. It is odd that the Communist Minister, who controlled civil aviation in a Socialist government, should sponsor the production of aircraft which are only likely to appeal to rich "reactionaries."

I was lucky enough to be allowed to fly both the Nord 1101 and the 1201. These are the product of the Société Nationale de Constructions Aéronautiques du Nord, which may be considered as the nationalized amalgamation of such old established firms as Potez, Caudron, C.A.M.S., Breguet, and others.

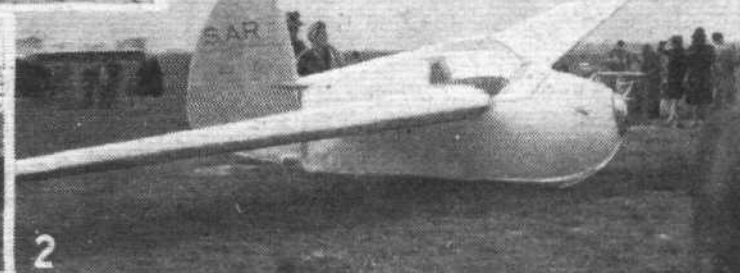
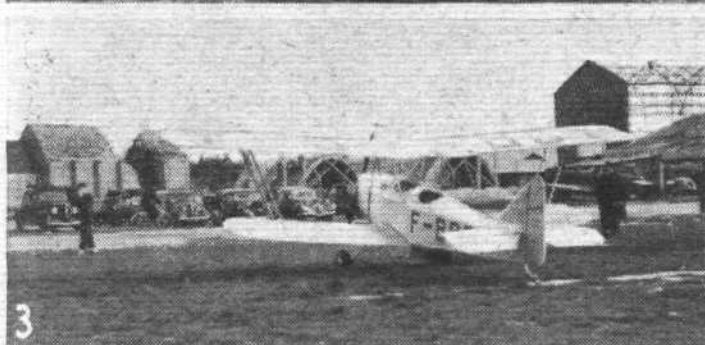
The Nord 1101 and 1201 are probably the finest light aircraft made in France at present; they are characterized by a magnificent finish and beautiful lines. The 1101, or "Noralpha," as it is called, is an all-metal low-wing four-seater monoplane. It is powered by an unsupercharged Renault 220 h.p. engine, driving a Ratier electrically operated c.s. airscrew. Both machines have tricycle undercarriages and trailing edge flaps, roomy comfortable cabins with excellent visibility, and good cockpit layouts. The larger Nord 1201 gives one the impression of being a Messerschmitt 108 Taifun with a tricycle undercarriage. This is not surprising since S.N.C.A.N. has just completed a large batch of 108s—which were known as Nord 1000s.

I found the Nord 1101 and 1201 just as pleasant to fly as their appearance suggests. As might be expected with aircraft with so much dihedral, both have remarkable lateral stability. Although the too-heavily spring-loaded elevator trimming gear was over-sensitive on each aircraft, they could be trimmed to fly hands-off very easily. On the 1201, which is a three-seater, the undercarriage is retracted by a hand-operated ratchet device which necessitates much work with a rather small lever. I found that the Renault Bengali 140 h.p. engine vibrated a little at maximum cruising r.p.m.—about 2,200—and that, consequently, there was rather too much noise in the cabin. The aileron control was a little on the light side for my liking.

Nord 1101 Characteristics

The more powerful Nord 1101 is naturally much more of an aircraft. Except for the elevator trim, which badly needs modifying, I cannot say that I have flown a nicer machine in its class. The take-off was a little long, but then we were four up and going uphill at Toussus. It cruises at a genuine 170 m.p.h. at full load (according to A.S.I.) and handles very well at low cruising speeds with a little flap down. The advertised landing speed seemed to me to be about right for the final approach.

Although I was unable to fly the SE.2300 and 2310, I was given a ride in the latter by Marcel Doret. These two aircraft are basically identical; all-metal low-wing monoplanes with fixed undercarriage—conventional on the 2300 and "tricycled" on the 2310. Both have Renault 140 h.p. motors, with fixed-pitch airscrews. Another light type produced by S.N.C.A.S.E., and shown at Toussus, is the



1. Small and handsome, the tiny Starck 70 has a 45 h.p. Salmson radial. 2. A flying-wing glider, the S.A.R. sailplane. 3. The Leopoldoff L 6. 4. The Guerchais-Roche 30 with Ford V8 engine. 5. Rear view of S.V.C. 10 twin-boom pusher.

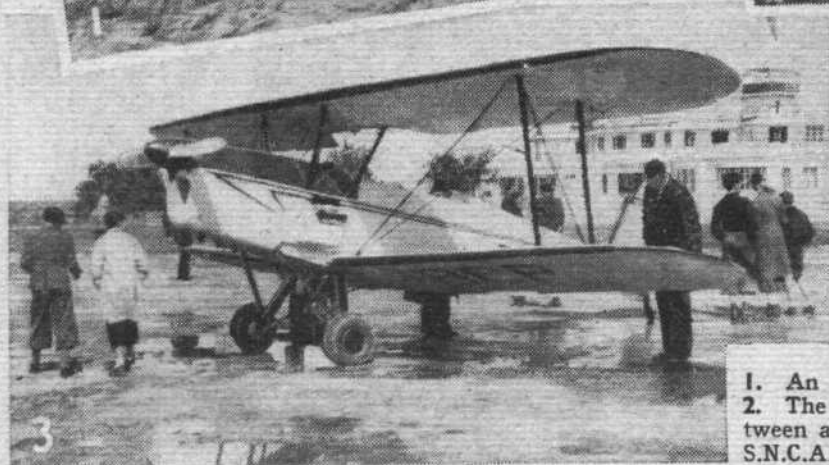
PRIVATE FLYING IN FRANCE

very interesting tail-less two-seater 2100. Although this machine has been flying for quite a long time, it is still very much in the experimental stage and is not yet on the market. On July 1 this year, Marcel Doret, accompanied by M. Deprez, managing director of S.N.C.A.S.E., put up a very good performance in the SE.2300. They accomplished a flight of 2,860 miles—Paris-Marseilles-Tunis-Bovfarik-Toulouse-Paris in 40 hr. 46 min. (or less than 23 hr. flying time), at an average speed of 127 m.p.h. Their longest non-stop flight was of 1,025 miles—covered with two hours' fuel to spare.

Certainly one of the most interesting efforts to produce a cheap yet relatively high-performanced machine has been made by the manufacturers of the Guerchais-Roche T.30, who have installed a Ford V-8 engine in their wooden two-

wing tricycles) represent the serious modern light aircraft being built in France. There is also the new S.U.C.10 "Courlis," which is at present undergoing its trials. This machine is of the flying automobile type, being a tricycle, four-seater, high-wing monoplane, all-metal, with a twin-boomed tail. The motor is a Mathis V.8 of 200 h.p. driving a pusher airscrew and being fan-cooled. The machine appears very well built and great things are expected of it—including a moderate price.

It would take up too much space to mention in detail all the individual types manufactured by the smaller companies. The majority of them are old designs, some modernized by the addition of flaps, some not modernized at all, like the trusty Leopoldoff biplane. The Paul Aubert Cigale 201 was pretty advanced when it was designed in 1937. It is a cantilever high-wing monoplane, either a two-seater or a four-seater, depending upon the engine installation. I flew it as a two-seater with a 75 h.p. Regnier engine which lacked two compressions. Even taking into account the missing compressions, the aircraft gave me the impression of being underpowered.



1. An all-metal two seater, the Bengali-engined S.O. 3050. 2. The Carmier 10 with 40 h.p. Train engine. 3. A cross between a Tiger Moth and a Bucker, the Stampe S.V. 4B built by S.N.C.A.N. 4. The incredible Peyret "Taupin," considered to be practically fool proof.

seater low-wing monoplane, as in the early Wicko over here. The V-8 has duplicated magnetos and two fuel pumps, but is otherwise standard; it drives a fixed-pitch airscrew through a reduction gear. Although doing its stuff well, the motor is naturally much too heavy in its present form. A modified Ford "Mercury" V-8 is being fitted with an aluminium crankcase and otherwise lightened by the Ford Company in Paris especially for installation in this machine. As the G.R.30 was in for a routine overhaul I was unable to try it in the air. However, M. Lanne, the doyen of French test pilots, kindly let me do a few circuits on the G.R.35, which is, apart from the fact that it mounts a Renault 140 h.p., identical. I found it a particularly easy, docile machine, whose flaps might be a little larger in area, and which badly needs a tail trimmer. I understand this is to be fitted to production aircraft.

The above-mentioned aircraft, together with the much-publicised Max Holste 52 tricycle all-metal two-seater trainer and the Morane 560 and 570 (likewise all-metal low-

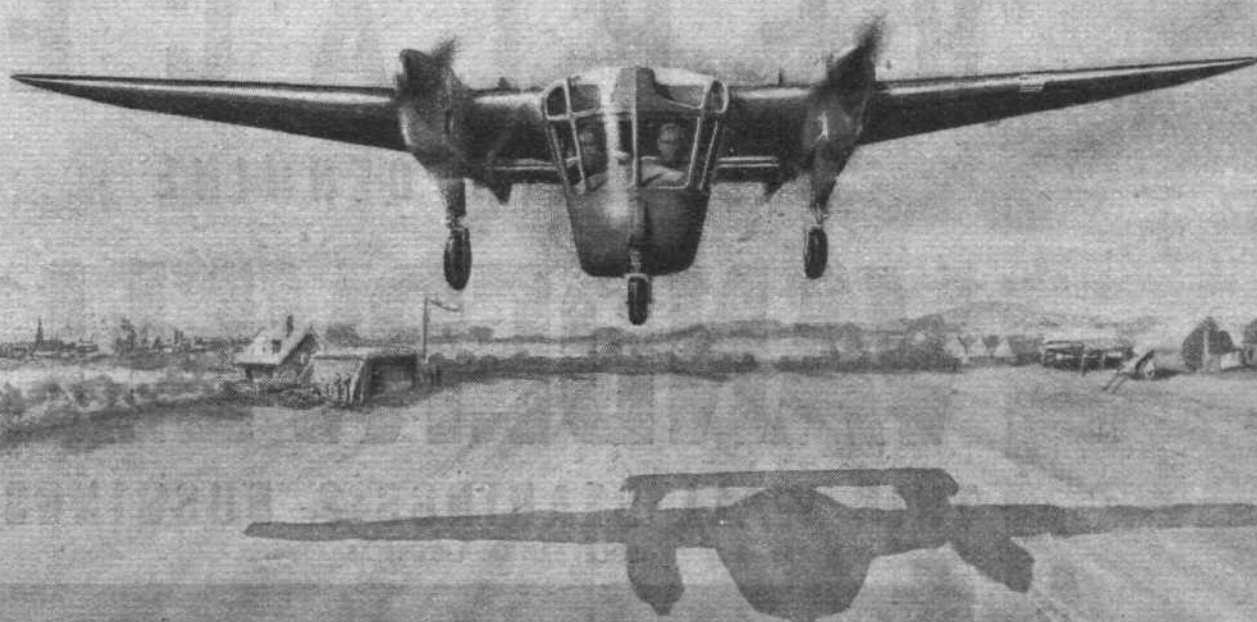
With the Renault 140 h.p. Bengali, as an occasional four-seater, this should be an excellent aircraft. It is very clean, having both cantilever undercarriage as well as wing, and handles very well in the air. Unfortunately, owing to the rather thick door-pillar and the close proximity of the front spar to one's forehead, it is rather blind in the air and on the ground.

Mauboussin and Starck

The old-established firm of Mauboussin are building two low-winged tandem monoplanes of wooden construction, resembling B.A. Swallows with flaps. Both machines are fitted with Salmson 60 h.p. radials.

Some incredibly fine work is being done by a young constructor by the name of André Starck. In a little Paris factory he is turning out two or three of his A.S.70s per week. This machine is worthy of a note. It is much to the author's regret that he had to leave Paris without flying it. Its performance at Toussus, in the hands of one

5 SEP 1946



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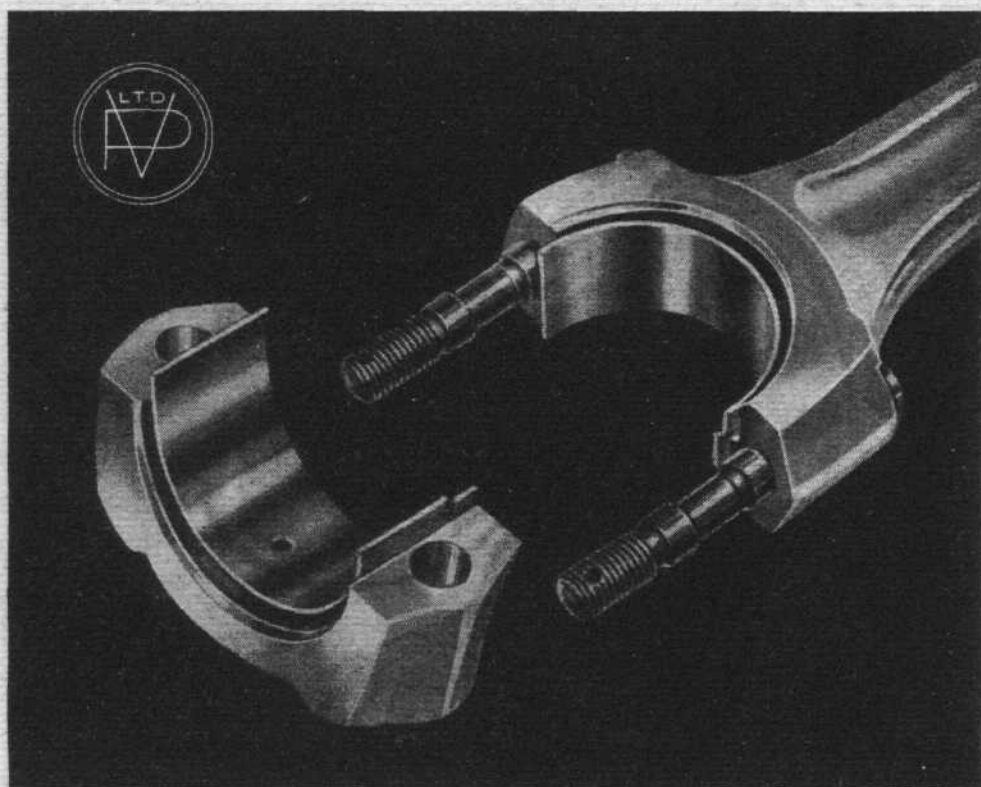
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of the Normandie-Niemen Group "aces," completely stole the show. It is a beautifully constructed little single-seater with light Perspex canopy, usually fitted with a Salmson 45 h.p. or 60 h.p. motor. The choice of motor rests with the buyer, and depends on what is available at the time. The ailerons, which extend the full length of the wing, droop to act as flaps for take-off or landing. Fixed slots are built into the leading edge and it is said to be spinproof. A two-seater fitted with a 100 h.p. Aster—Walter "Mikron" built under licence—is now in production.

It is long enough after the Toussus exhibition to gauge its reaction on the average French club member and prospective private owner. The French flying clubs—and there are about 150 active ones in France and plenty more in North

Africa—know exactly what type of machine they want, but they could not find it at Toussus. They are not interested in paying a great deal of money for a luxury machine with all the complicated modern inconveniences such as retractable tricycle undercarriages. I recently visited some of the French flying clubs fields in a light aircraft and I can vouch for the fact that they are not ideal for untried tricycles. Anyway, the number of nose-wheel failures during the week's exhibition at Toussus proved that. Neither do they want to waste quite a lot of money on out-of-date machines with doubtful engines. They want reliable aircraft, easy to maintain; aircraft which will fly all day and are suitable for school work, hire or private owners. They have seen the Cub and the Auster, and they know what they want. But the French Government insists that they need tiny pop-bottle single-seaters and high-performance touring aircraft.

The French light aircraft industry is working under very difficult conditions. Considering that she has had to rebuild her industry almost from scratch, France has accomplished a great deal. Bottle-necks have been very serious, due to shortages of accessories and so on. The S.O. 6000 jet-propelled machine was kept waiting almost a year for an undercarriage.

Government Support

However, in spite of all these difficulties, the industry, and private and sporting flying generally, seem to me to be in far better shape than in this country. The French Government is definitely trying to get private flying back on its feet. Recently the Government, through the Services des Sports Aériens, decided to loan Buckler and Stampe SV.43 biplanes to the clubs on certain conditions. These conditions are that, for every 150 hours flown per machine, one pilot under 21 years of age, fit for Air Force service, must be turned out with an "A" licence. Otherwise the clubs are free to use the aircraft in any way they like, though priority must be given to converting sailplane

pilots to airplanes. If these conditions are fulfilled then the Government will bear the cost of repairs in case of damage. Five hundred Piper Cubs have been obtained by the Government from the U.S. Foreign Liquidation Commission. These are certain to be distributed to the clubs and to private owners.

The suppression of the Certificat Restreint de Navigabilité (C.N.R.A.), a restricted C. of A. granted to small aircraft upon completion of certain simple tests, does not seem to have curbed the enthusiasm of the amateur constructors. Henri Mignet is back on the scene with a redesigned *Pou*, known as the H.M.290, in production. The

"Flea" enthusiasts are already busy at work in the workshops and garages. New light types are being made, including a powered sailplane, R.A.10M, built by Airanantic, who also make

the R.A.14 low-powered two-seater high-wing monoplane.

One of the most promising of the new types is the Boisavia 50. This is a new departure for a French machine in that it employs welded steel-tube construction, hitherto disallowed by the "Services Techniques." It is a side-by-side two-seater high-wing monoplane, of the same basic formula as the Auster. Is this the machine the French flying clubs are waiting for?

Engine Production

There is large-scale production of engines of all sizes from a flat-twin G-2 of 40 h.p., to a 220 h.p. V-8. With the Mathis all cylinders are said to be interchangeable from one type of engine to another. Renault, also, are producing in quantity. Apart from these two big engine companies, there are the Train, Regnier, Potez, Bloch, and Hochet-Mengin engines.

The majority of the aircraft constructors, including the nationalized companies, produce sailplanes. For instance, the Caudron factory of S.N.C.A.N. produce the two-seater G.800 in quantity for "les Sports Aériens." S.N.C.A.S.E. also make a very fine high-performance two-seater.

There are signs that the Ministère de l'Armement now knows what kind of machine the schools and clubs of France want. Maybe the questionnaires filled in by all and sundry at Toussus had some effect. Anyway, one of the biggest concerns, S.N.C.A.N., who realize that they have not touched the biggest market with their Nord 1201 and 1101, are considering putting into production the Potez 58, an old French favourite.

I don't think that the average French club member or private owner has got much to worry about; so much more enthusiasm is shown by the manufacturers, consumers and authorities. It is a change to see big concerns with time to build good quality light aircraft as well as jets, giant transports and so on, while the private pilots of this country have to content themselves with a very meagre diet of battered re-paints from the Kemble jumble sales.

NEW A.W. WING CONSTRUCTION ✓

A NEW form of construction has been developed by Armstrong-Whitworth for the laminar-flow wings of tail-less aircraft weighing about 30,000lb. This news is of particular interest as it follows an announcement by Sir Ben Lockspeiser that an Armstrong-Whitworth tail-less research aircraft with twin R-R Derwent jet units is under construction.

To obtain—and retain—a smooth wing surface a thick skin (16 G) is used. This is stiffened by an inner corrugated skin which prevents "waving" and deflections due to air loads. Structural efficiency is maintained by making the skin and corrugations take the whole of the bending and shear loads.

This method of building the wing is the reverse of the usual practice of building up from the ribs; the old method "added-up" errors cumulatively until the skin became the most inaccurate part of the structure. A new technique has been evolved of building the wing in halves, each half being made in accurately contoured formers into which the skin and corru-

gations are clamped. The half-ribs and half-webs are then placed and the two halves joined.

A specimen wing using this type of construction has successfully produced laminar flow in the N.P.L. high-speed tunnel, and a Hurricane fitted with a pair of wings made on the same principle is now undergoing flight trials at the R.A.E.

HESTON AIRCRAFT "A.O.P." ✓

A NEW Artillery Observation Post aircraft is being developed by the Heston Aircraft Company, Ltd., for the Ministry of Supply. Four machines have been ordered. The design features twin booms and a de Havilland Gipsy Queen 33 engine driving a pusher airscrew.

Requirements in an A.O.P. aircraft are good visibility, robustness, easy maintenance, and the ability to fly slowly and operate from emergency "strips."

A model of the new machine will be exhibited at Radlett during the S.B.A.C. display.

OVER THE ALPS

AFTER seven years of waiting, my joy in air wandering found its opportunity. True, my splendid Hornet Moth had been commandeered for the war and, though as tough as ever, I was 80 and therefore, owing to strange official prejudices, not likely to get a British flying licence again. Radically fit and yet disqualified!

There remained, however, the consolatory outlook of a chartered craft with an old friend, my instructor at Heston in 1934, in charge. And in Switzerland (where I hold the "brevet" of Category II) much could happen. Now, there is no flying in Europe, so far as I have sampled it, which can compare with Swiss flying. Excellent! So, on July 17th, Wing Cdr. Davy and I left Heston (*quantum mutatus ab illo . . .*) for Croydon in that excellent low-wing monoplane of Miles design, the Whitney Straight, powered with the 130 h.p. Gipsy Major engine, having side-by-side seating, a convenient baggage shelf, and flaps. It had, what were novelties for me, a direction indicator and artificial horizon gadget which certainly make blind flying through cloud quite easy.



The author of this account of an air tour to Switzerland is 80. In spite of being declared medically fit by his own doctors and by the C.M.B. doctors, the Air Ministry refused to renew his A licence. But he holds a Swiss brevet and can thus fly anywhere—except in England! However, there are ways of overcoming such minor handicaps.

Before the war Mr. Fawcett, who is now busy on a new work which is, he says, "to close his philosophical life," did much flying over the Alps in a Hornet Moth. This latest flight was made in a chartered Miles Whitney Straight.

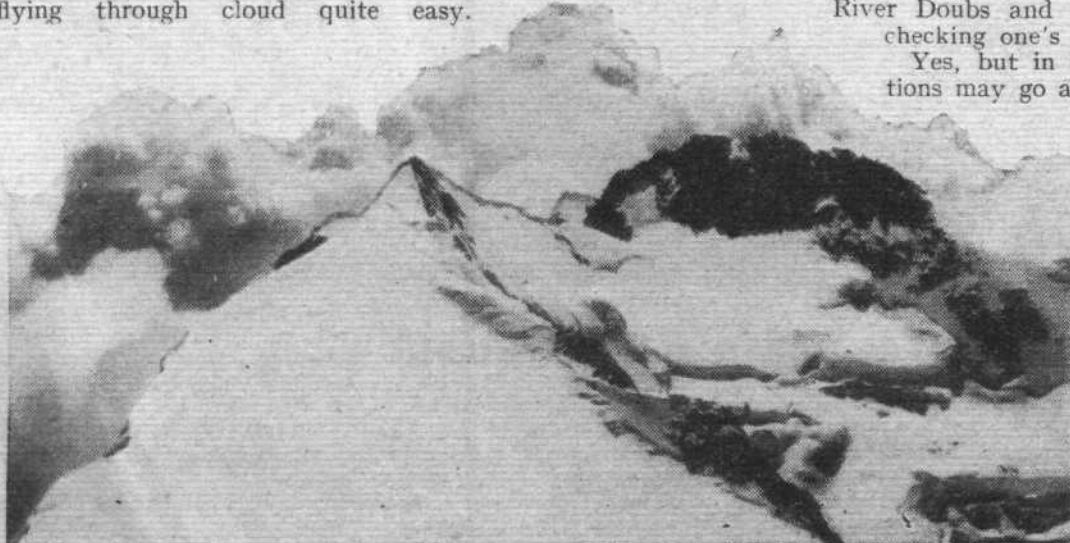
At Croydon the weather reports were unfavourable, so the start was deferred till the next day. The course then was over Tunbridge Wells, reaching the coast near Hythe, to Le Touquet, with low-level flying across the Channel in the teeth of sheets of rain. But when France was reached came the sunshine and, after an uneventful and most pleasant flight (that of men sitting idly behind an engine and enjoying the landscapes) we were taxiing across the tarmac at Le Bourget. Navigation to Paris in good weather is easy—we took turns at the stick (or rather sticks) and all went as merrily as could be wished.

Needless to say, officialdom, within glum, battered Le Bourget, did not ease proceedings, while "refreshments" suggested that the shortage in Paris was quite acute. At last refuelled and free, we were off on a bearing of 128 deg to-

wards Montbéliard, where we intended to cross the North-West Swiss frontier—over the Juras, making for Berné. I had found this a very convenient route in the old days, since the landmarks afforded at Montbéliard by the River Doubs and the Rhône-Rhine canal made checking one's course simple.

Yes, but in bad weather the best calculations may go awry. I had been turned back once to Berne by Jura storms on the way to Paris. We were to be turned back now, not by storms but by masses of cloud, putting a craft without radio and knowledge of conditions inside Switzerland in an unpleasant situation among the mountains. In fact, storms with low cloud were occurring then in "Europe's Playground."

A scene photographed by the author while ridge-flying round Zermatt.



Early Birds' Air Tour Across France to the Matterhorn : Some Pleasant Recollections—and a Warning or Two

By DOUGLAS FAWCETT

Very good weather had been enjoyed, and an easy crossing of the Juras had seemed likely. But the clouds round about Montbéliard proved to be thick; we had to descend from some 5,000ft to about 700. Yes, there was the Rhône-Rhine canal, and there was the loop of the River Doubs, but ahead always thickening cloud. We followed the narrow Doubs valley for a while, to perceive that to make for Switzerland would be just foolish. So we had to turn westward, hoping to reach a French airfield, although many of such places available for our retreat are at present deserted.

Good Range Essential

A long search might impose itself. Then, as time slipped by, came an awkward discovery: petrol was running short. May I take this opportunity of warning amateurs not to trust themselves to any new light aircraft which has not a good range; that is if they want to enjoy Continental touring safely. My old Hornet Moth had an excellent range, using six gallons of fuel an hour out of her store of 36. Yet even with this store I had once no more than three gallons left on landing at Lyons after a long fight with fog!

The Whitney Straight has a good range; its misfortune was due simply to the weather. And we were not solving the problem created by the clouds. So pilot decided

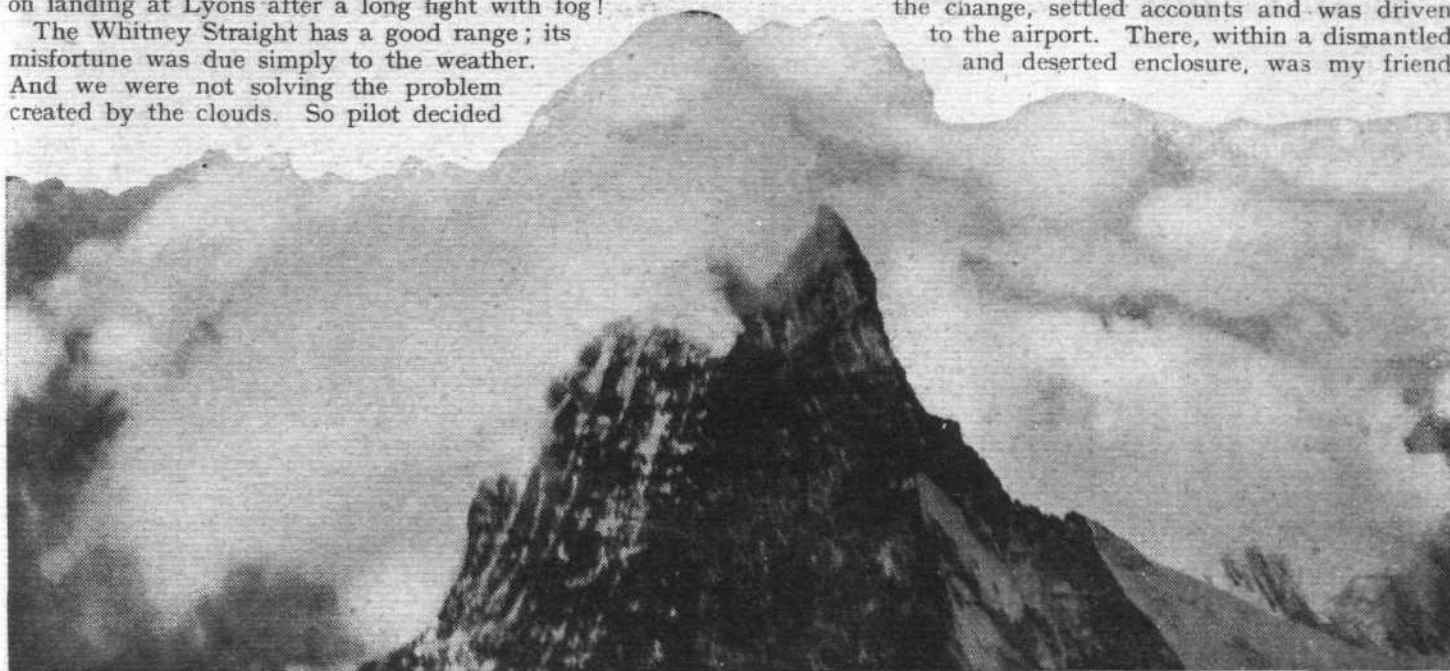
lacked was made of no account by two bottles of capital Maçon. These bottles were entered in the bill as worth 700 francs, but such astronomical figures were less startling than they looked, the £1 exchanging for 480 francs.

Next day the take-off, which required a light burden, was fully successful. Pilot got away downhill in about 100 yards, making for Besançon, 20 miles off, which could just be reached with the petrol left, it was hoped. I took all the baggage and drove in a rickety

old car to Besançon, having to get change at the Bank of France and meet my friend at the airport.

No need to dwell on my fight with officialdom; I got the change, settled accounts and was driven to the airport. There, within a dismantled and deserted enclosure, was my friend

Wing Commander Davy who shared the flight with Mr Fawcett.



This picture was taken by the author on a pre-war flight, when the Matterhorn was busy making cloud but had not been quite hidden. The height is 14,780ft.

to try to land. Down we swept into the valley, running roughly north and south. Petrol-level indicators are not always reliable, and one had to be on the safe side. Prospects at first seemed poor—small peasant properties interspersed with woods, fields with ditches, palisades, cows, heavy crops, etc., looked anything but hospitable. Yet, after much fast low flying and inspecting, the opportunity came. We glided down a lane of grass, which curved towards a clear slope bordered by wheat. Down to the second notch went the flap control, and the craft touched down at about 50, took the curve with a lurch and, climbing up the slope beside the wall of wheat, came to rest unhurt. A truly fine piece of work.

In a few minutes M. le Curé and a crowd of villagers had collected, all very interested and friendly. We were near Vallerois le Bois, in the Haute Saône. Our valises were carried to the village inn, guards were posted to sleep in the craft, and we began to wonder what compensations for us supper would provide. Well, our supper was simple but well cooked by Madame Sagot, our landlady, and what it

sitting like Patience, but inside her monument! Four hours after, having secured petrol of automobile, not aviation, quality, we soared out of high grass and, with immense relief, got clear of Besançon.

We were now about 70 miles from the frontier, rising to 5,500ft as we crossed it. I held my stick with glee when I saw once more on my right Neuchâtel, the lake of that name, and the lake of Morat; on my left the Bielersee and the river Aare, and ahead, in the gloom of a threatening summer storm, the outlying houses of Berne. The spectacle was a fine one indeed. We enjoyed it heartily as the craft, sailing over the centre of the city, floated down to rest in the pretty airfield of Belp-Moos that lies beside the rushing Aare. Far away to the south-east, half hidden in cloud, towered the giant peaks of the Bernese Oberland. The black awnings of the storm soon wore thin and left us in peace.

Dinner at the Hotel Bristol was entirely satisfactory, luxurious, in fact, after London fare. Wine, too, at tolerable prices, was at call. But it must not be supposed that



Another picture taken by Mr. Fawcett when the sky was clear. From above the Matterhorn one looks towards Mont Rose (15,200ft). Below is the Porner Glacier.

all Switzerland is in clover just because the hotels are well supplied. The hotels are kept hospitable because the tourist traffic of the future is in view. Reports of friends show me that the private householder is far from being well fed, while taxation here, as with us, is most severe. I know English and other foreign residents who are packing

OVER THE ALPS

Prices are high and the exchange 17.35, and that only for travellers' cheques. For £1 notes it is about ten.

Like most examples of the modern European State, Switzerland exacts more sacrifices from its residents than it is worth. And more particularly those likely to be taxed in *two* countries, their native and their adopted, will do well not to commit themselves without much thought. I paid a visit recently to a British villa resident at Montreux half ruined by double taxation; victim of those thefts which we dignify nowadays by the name of State Finance.

The next day we paid a visit to the Valaisian Alps, which include the Matterhorn. This was to be my special job, as for years I had been a sort of air-yachtsman in the High Alps. The weather was friendly but extremely cloudy. I had to nose through a "hole" to find that a familiar route to the Matterhorn—up and over the Kanderthal—was blocked with cloud; that the Jungfrau, Finsteraarhorn and all the other giants of the Oberland were hidden, while little could be seen even of the lake of Thun and Neisen, Interlaken.

Above the Clouds

There was only one thing to be done: to gain height slowly along the line of the lake, Interlaken, and the lake of Brienz beyond, and to turn back on to our true course when above the Brunig Pass. This was done, and at 14,000ft or so we had the mastery, sailing above the lovely folds of the cloud mass, and soon left the Berner Oberland behind.

At 15,000ft we could see, through a hole, Sierre (where I am now) and its lake of Géronde at the bottom of the great trench through which flows the Rhône. But where were the famous Valaisian peaks which ought to be near us? Not one was outlined clearly; they were lapped by a vast sea of clouds. Some were hidden, a few just recognisable by one who knew them well. The Matterhorn, Weisshorn and Dent Blanche were just discernible in this way. My

friend, who had seen enough of these submerged monsters, drew my attention to the less heavily veiled beauty of the country to the west—to far-off Lakes Lemman, Neuchâtel and Morat in the lowlands. Down we went in a long glide, swooping over the Canton of Freiburg and its Capital—not without some antics on the way—and reaching at last Berne by way of the west. What a circuit!

Despite the veiling of the great mountains, it had been a wonderful outing. The Whitney Straight had behaved superbly. Would you like some figures about her general performance? At cruising speed in normal touring her average was about 96; that of my old mountaineering Hornet Moth was 92; in climbing she gained height more slowly than did my old craft, but had no difficulty in getting as high as was required. Altogether, powered by the Gipsy Major engine, she was a craft in which the mountain flier could place his trust fully.

In view of the few landing places available in and near the Pennine Alps (where such superb flights await the airman), the following information may be useful. There are two landing places, I am told, in the Rhône Valley, at Fourtemagne and Rarogne, while the airfield at Scion, capital of the Valais, may prove a haven indeed.

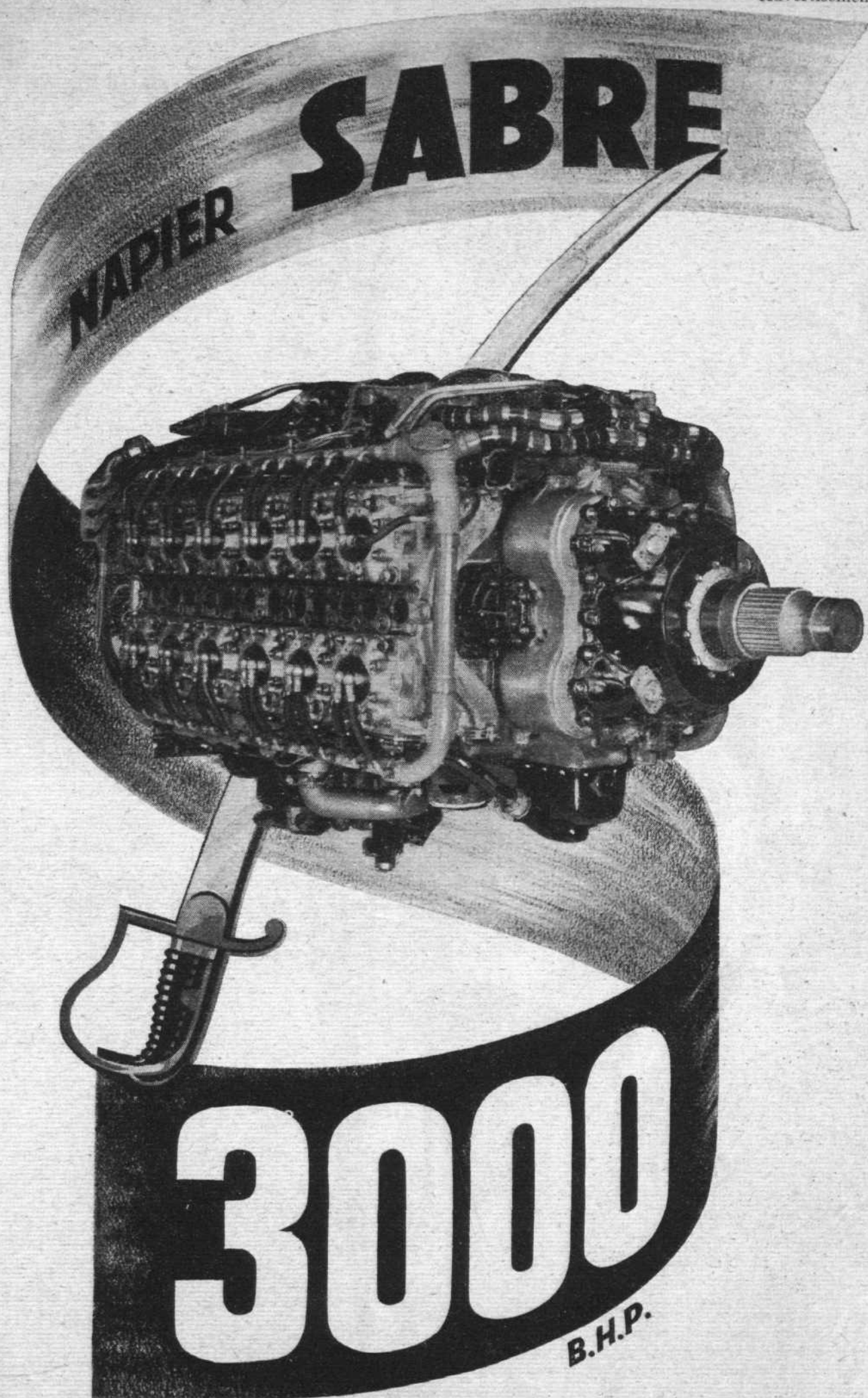
I observed also myself that, in the dreaded Valley of St. Nicholas, it would be possible to land a small aircraft at a pinch on the right bank of the Visp, just above Fäsch, and on the left bank of that torrent, just above Randa. It would not be a pleasant business, but mishaps when visiting Zermatt and the Matterhorn are not remedied easily. 'Ware your map!

ILIFFE JOURNALS AT S.B.A.C. SHOW

THE S.B.A.C. exhibition and flying display at Radlett next week-end is particularly designed to appeal to officials and firms who are able to influence the sale of British aircraft and engines abroad, and both *Flight* and its associated journal, *Aircraft Production*, which have a strong interest for overseas readers, will be prominently shown there.

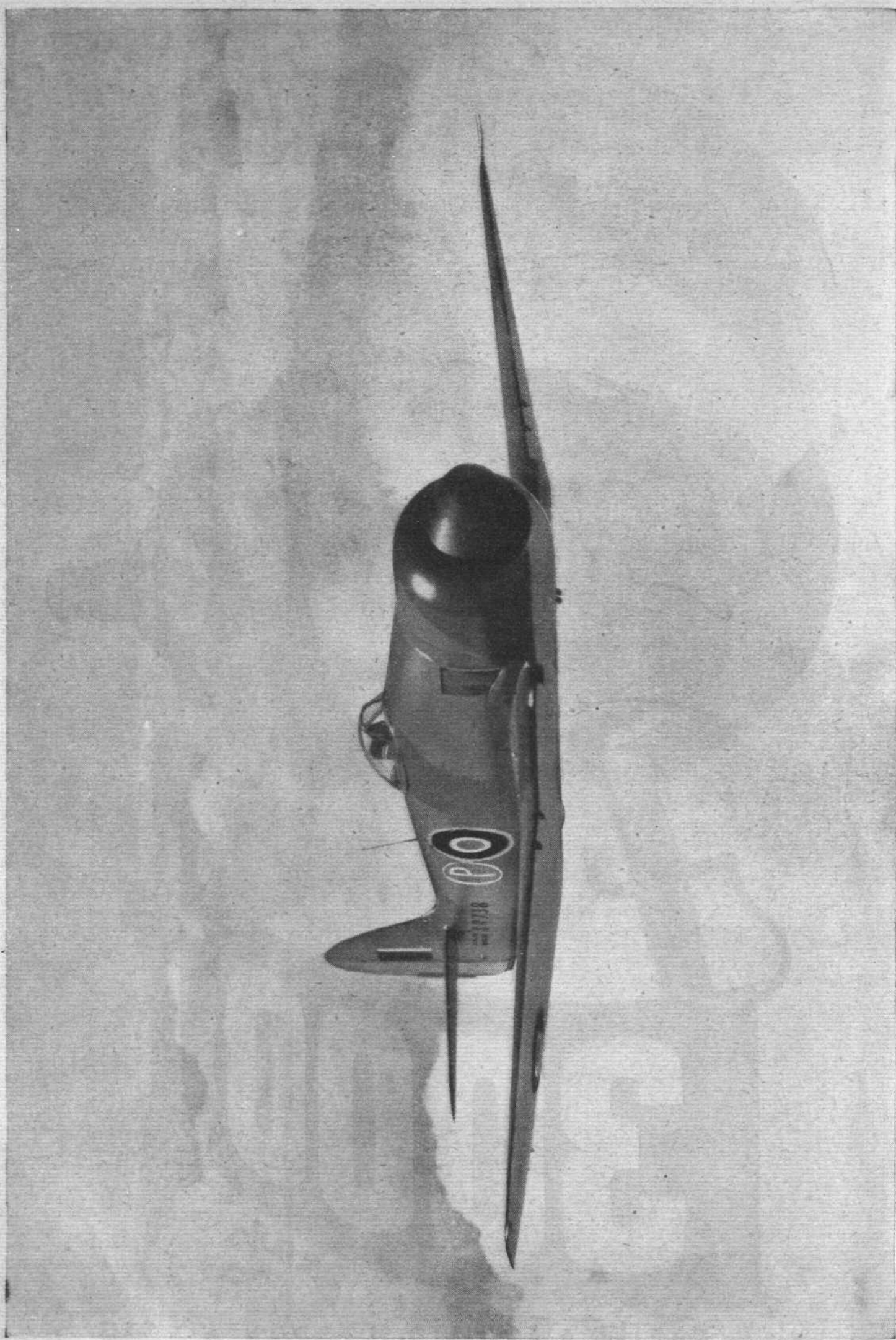
Stand 113 in the static section will display, in addition to these two periodicals and photographic enlargements from their pages, selected Iliffe reference books, including the latest edition of Mr. Geoffrey Smith's *Gas Turbines and Jet Propulsion for Aircraft*.

The September 12th issue of *Flight* will be a special enlarged number, containing a complete guide to the static exhibition, and eight pages in photogravure depicting outstanding British military and civil aircraft. There will also be special features dealing with civil types of aircraft to come, and surveying the current examples of jet and turbine/airscrew power units to be seen in the exhibition.



A detailed black and white photograph of a Napier Sabre 3000 B.H.P. engine, a 12-cylinder radial engine, is the central focus. The engine is shown from a front-three-quarter view, highlighting its complex internal components, including the cylinder heads, valves, and various mechanical linkages. It is mounted on a dark, curved base that resembles a scabbard. A curved banner arches over the top of the engine, featuring the word "NAPIER" in a stylized font on the left and "SABRE" in large, bold, sans-serif capital letters on the right. Below the engine, the number "3000" is printed in very large, bold, white sans-serif digits on a dark background. To the right of the "3000", the text "B.H.P." is written in a smaller, italicized font. The overall design is dynamic and emphasizes the power and engineering of the aircraft engine.

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Hawker Sea Fury (Bristol Centaurus Engine).

Pressure-Pattern Flying

A Useful Method of Checking Navigation from Barometric Pressure Data

PRESSURE-PATTERN flying is a broad term embracing all aspects of navigation which are dependent upon pressure-height data; it is not another independent method of navigation. The Americans have called the principle Aerologation, derived presumably from Aerology, their name for the science known to us as meteorology.

The Empire Air Navigation School have considered the principle worthy of experiment and have already made long-distance test flights, the results of which proved that the method has economic advantages of possible value to civil airlines.

It must be appreciated that the idea is young, and at the moment the principle has been applied in only two directions: single-heading flight and the other, a method of checking drift whilst flying blind over the sea, which for the purposes of this article will be called pressure drift-finding. Before describing either method some basic principles and limitations must be considered.

In latitudes greater than 25 deg from the equator the geostrophic wind-formula may be applied. This is a working approximation connecting wind velocity with the gradients of atmospheric pressure. The wind tends to blow along the isobars, strongly where the isobars are close, and weakly where they are far apart. Also, Buys Ballot's Law states that, in the northern hemisphere, if you stand with your back to the wind, pressure is lower on your left hand than on your right, and in the southern hemisphere the opposite is true.

Single-heading Flight

Whereas a Great-Circle route is the shortest distance between any two places, it is not necessarily the quickest route to fly, bearing in mind the influence of the wind. If it were possible to fly around a pressure system, using a tail wind, naturally the distance would be covered in a shorter time, but as long distances have to be flown, passing, perhaps, through several weather systems, this is

seldom possible. It is possible, however, to calculate a mean wind over the whole route and by its application steer a constant course which will subject the aircraft to more favourable winds. Thus it follows that although a greater ground distance may have to be flown, the ground speed will be faster and the air distance less owing to the avoidance of unfavourable winds. The time-saving possible in this method has been proved by several long-distance test flights by the E.A.N.S. aircraft *Aries*. The pre-flight calculations are dependent upon accurate pressure forecasting, or predetermination of the height of pressure surfaces.

The height of the pressure surface at the time of departure at the planned height of flight is required, and the same for the destination, but at the time when the aircraft may be expected to be half-way to the destination. The forecast pressure estimated at the time of arrival at destination would be unsatisfactory owing to variations which might take place during the period of the flight. The two readings will produce a pressure gradient or mean slope of the isobaric surface to be flown, and hence the mean drift angle; this will give the single heading. The formula used to obtain this result

$$\text{is as follows: } Z_n = \frac{K (D_2 - D_1)}{\text{TAS}}$$

Where Z_n = cross-wind effect in nautical miles, K is dependent upon latitude $\left(\frac{21.47}{\sin \text{mean latitude}} \right)$, $D_2 - D_1$ are the height readings in feet. The second formula is $\sin X = \frac{Z_n}{\text{total distance}}$ where X = mean drift angle.

Pressure Drift-finding

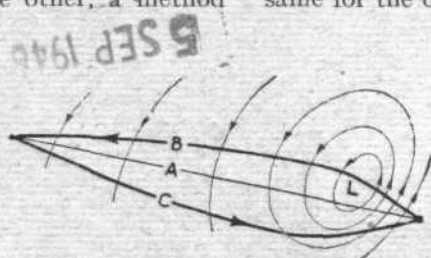
In the ordinary course of flying, a constant check is kept by visual methods upon the amount of drift. This is impossible, of course, when flying blind, or above ten-tenths cloud, and may be an embarrassment if continued for a long period when other aids to navigation are not available.

With the assistance of a radio or radar altimeter, the actual height of an aircraft above the sea may be obtained, subject naturally to instrument errors. Further, by using an altimeter as an aneroid barometer, it is possible to fly at a given pressure level. If a constant level is flown, successive readings of height will represent the variation, higher or lower, of the pressure level.

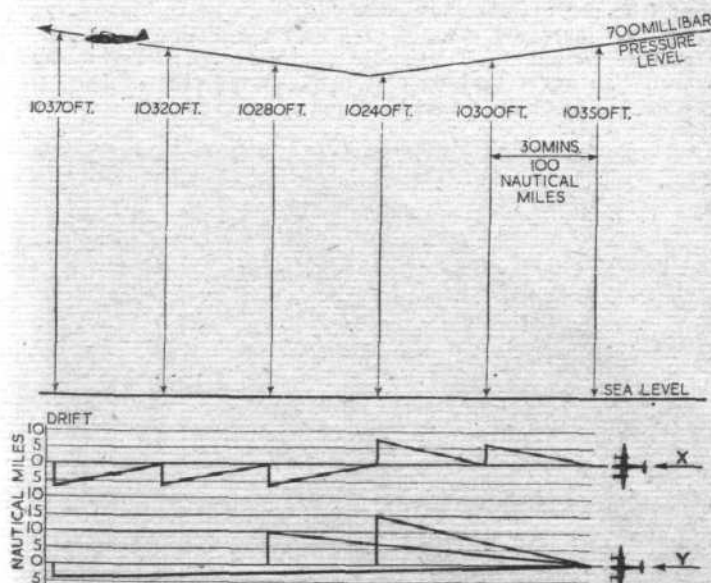
It follows naturally that from the difference in the two readings a height is found, which represents the difference in surface level of the given pressure, over a known distance, the air miles travelled by the aircraft. Since the geostrophic wind varies with the latitude, the sin of the latter is again included in the calculation, the formula for which is V_n (wind component) = $\frac{K (D_2 - D_1)}{(\text{Air dist. flown}) K}$

having the same value as before $\frac{21.47}{\sin \text{lat.}}$. The result is a

beam wind component in knots, which is laid off at right angles to the course, at the distance flown during the period of the two readings. The direction of drift caused by the beam wind component is dependent upon whether the pressure is rising or falling. If the pressure is rising, and the direction of flight is towards a "High," in the northern hemisphere the wind will be from the starboard side, giving



HORIZONTAL SEPARATION: Both flying on a single heading but in opposite directions, two aircraft influenced by the wind make good on the tracks B and C on either side of the Great Circle A.



DRIFT FINDING: Illustrating the use made by a navigator of information from pressure data. The diagram X shows drift between single readings and Y the drift resulting from several readings in the height diagram, all at latitude 50°N.

PRESSURE-PATTERN FLYING

port drift, and the converse if the pressure falls. The beam wind component, although laid off at 90 deg. to the course, does not represent the angle between the course and the direction of the wind, because the following or head component is unknown. It is this component which affects the ground speed.

At its present stage of development the principle provides simply a means of checking drift, so enabling accurate "track crawling" whilst flying blind, but it can be a quick and accurate check if prepared tables are used. Drift readings obtained in this manner are more accurate than flight plan drifts, since they are based on current information.

A further use may be made of the information, however, if a sun shot can be obtained, or some other means of obtaining a position line is available, for it follows that if a line is drawn through the end of the wind vector, parallel to the airplot, a line of position is determined. If this can be crossed with a DF bearing, sun line or celestial line, an accurate fix can be obtained.

Perhaps the most far-reaching effect of this use of meteorological data is its application to the control of air traffic. It will be readily seen that if two aircraft are flying in opposite directions between the same two points, and each one flying on a single heading, they would be separated on a horizontal plane, as the wind would be causing the actual tracks to be on opposite sides of the great-circle track. Thus the existing rules of odd and even heights to obtain vertical separation would be unnecessary. This is a great safety factor for the operation of airlines.

LOCKHEED CONSTITUTION APPEARS



An idea of the relative size of the new Lockheed Constitution can be obtained by comparison with the Lockheed 12 on the right.

ALTHOUGH the prototype has been built for transport work with the U.S. Navy and is known as the XR-60, this first of the big Lockheeds is virtually the long-awaited Constitution. It appeared for its taxiing tests on August 21st after three years of development work.

The Constitution is not quite as big as our own Brabazon I, but its maximum all-up weight is, nevertheless, and according to reports, of the order of 206,000 lb, and, like the Bristol 167, it has been laid out for the eventual installation of gas-turbine power units. In the meantime it is fitted with four Pratt and Whitney Wasp Majors of approximately 3,000 h.p. maximum each, with which, presumably, the type can be considered to be distinctly under-powered. The span is 189ft and the length is 156ft. No detailed figures have yet been given for the payload or performance, but the useful load is given as being approximately 78,000 lb, the maximum speed as 300 m.p.h., and the stalling speed as 80 m.p.h.

Except for its size and the fact that it has an "hour-glass" section fuselage, the Constitution is fairly conventional in lay-

out. When used for passenger transport the upper deck will have seats for 92, while the lower deck will take 76 passengers. Cargo space runs from 2,000 cubic ft when carrying a maximum passenger load, to 7,405 cubic ft when the entire lower deck is used only for cargo. The cabin will be pressurized to maintain a 10,000ft atmosphere at 25,000ft. Not unnaturally in such a large aircraft, every effort has been made to provide facilities for "in flight" maintenance; there are man-size tunnels within the wings, and, in addition to the pilot, co-pilot, radio operator and navigator, the XR-60 has stations for two flight engineers. Following Constellation practice, it will have hydraulic-boosted controls and Lockheed-Fowler flaps. Thermal de-icing will be used.

Two mildly unusual features of the tricycle undercarriage are, first, the use of four-wheel units for each of the main legs—providing increased contact area and permitting a saving in structure weight—and, secondly, the use of a steerable nose-wheel. To assist braking and manoeuvring, the inboard air-screws will be of the reversible type.

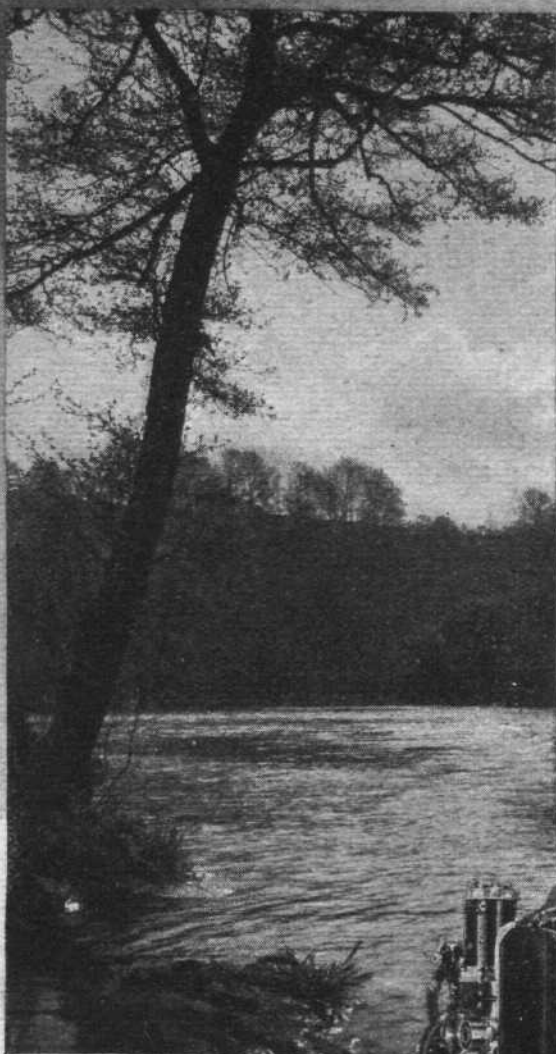
The "tracking" multi-wheel arrangement and the "hour-glass" section fuselage can be seen in this view of the XR-60 which will by now be making its initial trials.



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5 SEP 1946

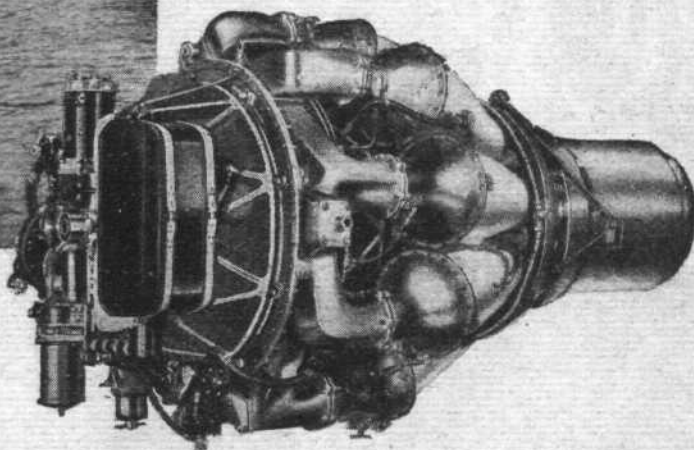
The River Class



The River Derwent

The Derwent

engine powers the Gloster Meteor, which is the standard jet-propelled fighter of the Royal Air Force and gained the World Speed Record for Great Britain.



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CIVIL AVIATION NEWS

I.A.T.A. Review Design Features of A.W.55 Global Encirclement

THROUGH THE NOSE:
Loading a Lancastrian at
Heathrow with thousands
of pairs of stockings for
export to Oslo.



NEW CIVIL APPOINTMENTS ✓

THE Ministry of Civil Aviation has announced the appointment of Mr. G. S. Dunnnett as Under-Secretary of the Ministry in charge of the Air Services Department. The appointment was dated from September 1st, and Mr. Dunnnett is being seconded from a post in the Treasury, where he has been in charge of the division dealing with transport and power. His department will act as a liaison office between the Corporations, charter operators, Empire and foreign operators, and the Ministry of Civil Aviation. The appointment is a part of a minor reorganization of the Ministry which is now under way.

Sir Frederick Tymms has been appointed the United Kingdom representative on the Council of the Provisional International Civil Aviation Organization in succession to Air Chief Marshal Sir Frederick Bowhill, who, it will be remembered, was recently appointed Aeronautical Advisor to the Minister of Civil Aviation. Sir Frederick Tymms is at present the Director-General of Civil Aviation for India, which post he expects to vacate during 1947 to take up his new position in the autumn. In the meantime, Sir James Temple Cotton will act as the representative. Sir James was, until recently, Under-Secretary in the Ministry of Aircraft Production. Sir Frederick Tymms has been connected with civil aviation for twenty-seven years and, before his present appointment in India, served for twelve years in the Department of Civil Aviation of the Air Ministry. He has participated in several important survey expeditions.

A former well-known Imperial Airways pilot, Wing Cdr. Lawrence Eggesfield, has been appointed to the newly created post of Director-General of Civil Aviation in the West Indies. With headquarters in Trinidad, the Director-General will be responsible for co-ordinating all British services in the Caribbean area. Wing Cdr. Eggesfield, who is attending the P.I.C.A.O. Conference in Washington convened to discuss flying facilities for the Caribbean area, flew the first passenger service from Alexandria across India to Singapore, and also the first service from Alexandria to South Africa. In 1939 he was Deputy-Director of Civil Aviation in India.

MORE ABOUT THE A.W.55 ✓

IN *Flight* of August 22nd we gave some preliminary information about the Armstrong Whitworth airscrew-turbine-powered transport which is being constructed to the Brabazon IIB specification. This is a 24/30-seater, with four 1,000 h.p. Armstrong-Siddeley Mambas.

Some further estimated figures have now been obtained. For instance, its span will be 92ft, and the wing area will be 840 sq ft; the cruising speed at 2,000ft will be 240 knots, and, at the same height, the still-air range will be 1,175 nautical miles.

More interesting still is the fact that a high standard of safety has been the first objective in the design. To this end two somewhat unusual features are being incorporated. First, in order to check yaw in the case of engine failure at take-off, the single large fin and rudder is divided into three separate surface

areas by two vertical hinges. Only the aft portion is moved by the pilot's rudder pedals, and when this portion reaches a certain maximum angle hydraulic power is used to operate the second movable part of the rudder. Secondly, the under-carriage travel is being arranged to be sufficient to enable the aircraft to glide, with safety, unchecked into the ground. A thermal de-icing system is being incorporated.

I.A.T.A. BULLETIN ✓

THE third bulletin to be issued by the International Air Transport Association is now being distributed, and Sir William Hildred, the Director-General, has introduced the publication with a foreword, referring briefly to the activities of the Association during the past six months.

A great deal of hard work has been put in during the last year by I.A.T.A. on behalf of the operators—due largely to the circumstances arising from the change-over from military to civil air transport. The creation of P.I.C.A.O. as a "recommended" body representing the Governments has increased the task of I.A.T.A., whose close and wholehearted co-operation has been of great importance.

The Director-General mentioned that the Executive Committee met during May in Montreal and reached many important decisions, all of benefit to international air transport as a whole. The Financial Committee's main task was to consider P.I.C.A.O. statistical reporting forms for traffic and finance and to prepare appropriate amendments in order to save the work and money of airline operators. It was also necessary to start negotiations for the establishment of a Clearing House with a European and American branch, and to prepare a questionnaire concerning insurance coverages, policy provisions and other related insurance matters, in order to plan the future work in the light of the replies received. This committee will meet again early in October to review its work and to prepare final recommendations on these subjects for the general meeting. The Legal Committee examined seven draft conventions with a view to assisting in the deliberations of the P.I.C.A.O. Assembly. It is hoped that a meeting of the committee will be held in Europe before the general meeting in Cairo.

The Technical Committee created eleven sub-committees to match the various corresponding divisions of P.I.C.A.O., and an analysis of the six Chicago annexes was made and redrafted into the new form of "International Standards and Recommended Practices." The work of the Traffic Committee impinges on that of the Legal and Financial Committees in the matter of traffic forms and documents, and the three will work closely together. The benefits to the international airline operator of what the Traffic Committee is trying to do in the matter of aiding P.I.C.A.O. in the facilitation of international air transport will be obvious. I.A.T.A. is the only body in a position to cover the requirements of the world's airline operators.

Referring to the necessary increases in the staff, Sir William stated that men will be picked for high administrative qualities and experience, capacity for hard work, and readiness to go to

CIVIL AVIATION NEWS

any part of the world at a moment's notice. At present there is too high a proportion of English-speaking people, but all operators and many Governments have been pressed to release staff of their own nationality, though they have not yet been able to do so. It is hoped that, as the European countries settle down and secure more trained men, they may be able to spare a number for work at I.A.T.A. headquarters or in the branches. It is inevitable that many of the younger staff must be Canadian or American owing to the situation of the headquarters in Montreal.

At the first annual general meeting it was decided to create branch offices. The functions of the branches are outlined in the bulletin, but Sir William announced that the first to open was at Paris in March, 1946, the next at New York in June, and the third will be opened this summer in Cairo. The fourth at Rio de Janeiro will also open during the summer, and negotiations are going ahead for the fifth at Johannesburg and the sixth at Sydney. The branches will act as links with the controlling head office and as administrators and servants of the traffic conferences which take place within their regions. The co-operation between P.I.C.A.O. and I.A.T.A. was described by Sir William as excellent. There was the closest co-operation in all departments, and the authorities of P.I.C.A.O. have already expressed their gratitude to the I.A.T.A. Committees. The operational knowledge, ideas and practical experience of representatives of I.A.T.A. are made available to the P.I.C.A.O. divisions, which are responsible for making recommendations to the Council and the Assembly. Thus the objectives of the operators are watched.

AIRWORK TRANSITION

SINCE the almost forgotten pre-war days of Heston and the somewhat happy-go-lucky aviation world of the inter-war years, Airwork, like several other concerns of a similar nature, have been largely involved in the completion of military contracts. During the past six months or more, however, the company has been rapidly returning to peacetime conditions, and the hangar space at Gatwick Airport is taken up very

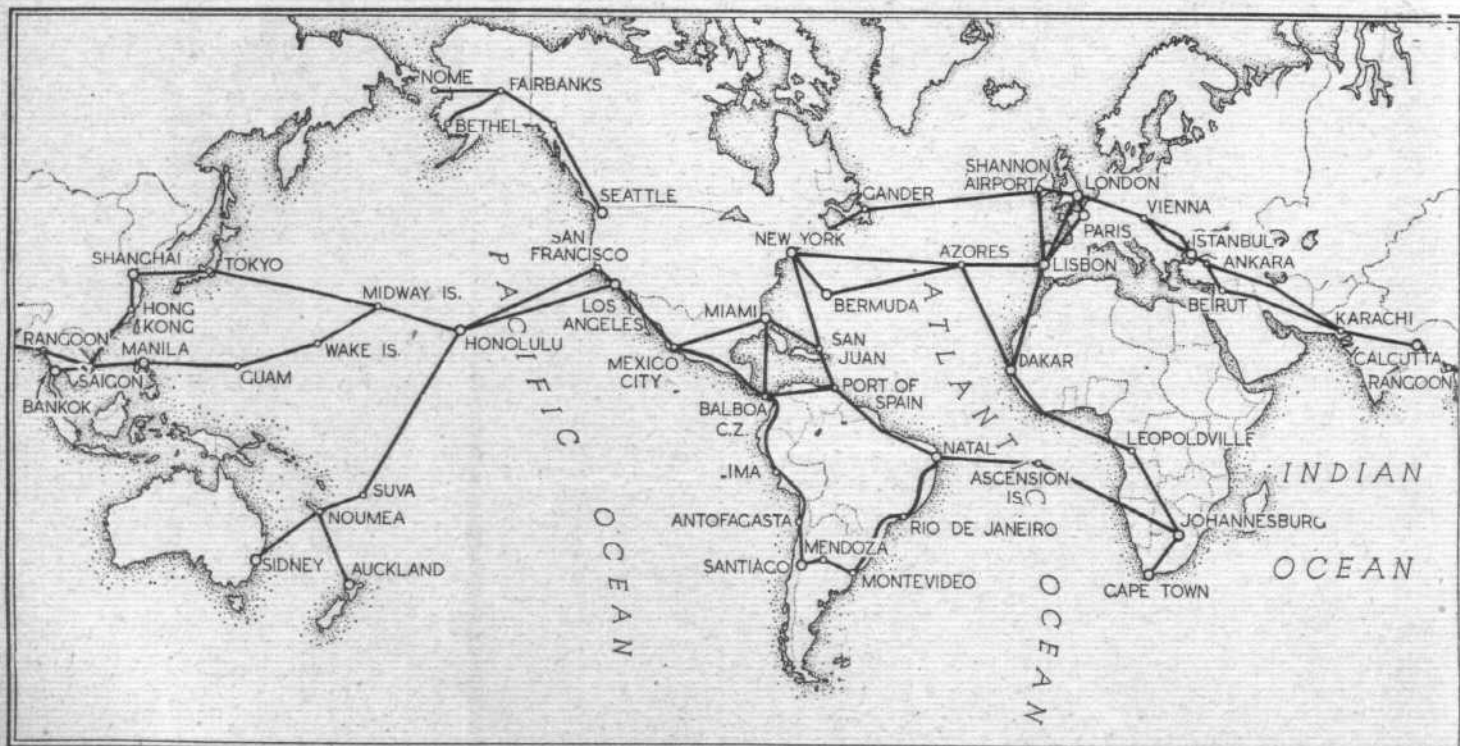
largely with overhaul and modification work of an almost purely civil character.

Recently, Airwork have, for example, been working on the civil conversion of military Dakotas both for K.L.M. and B.O.A.C.—three for the former and ten for the latter, so far—with a further contract for thirty-eight overhauls for the Ministry of Supply and breakdown jobs for purposes of "cannibalization." Incidentally, though the term "breakdown" is one which suggests a very simple piece of work, this can often be almost as troublesome as one in which more useful results are obtained. The company has now been given the work of breaking down obsolescent military aircraft in the Scottish and Cumberland area—and anyone who has seen the number of such aircraft which litter the fields surrounding any M.U. will appreciate the amount of travelling and the extent of general organization required in any such widespread breakdown contract.

In addition to all this, Airwork also look after the now quite large Ministry of Civil Aviation aircraft fleet at Gatwick, and are, of course, proceeding with the development of a world-wide sales organization for types such as the Bristol 170 and Vickers Viking. As an example of the kind of general work undertaken by Airwork, they have secured a contract from the Sudan Government to run a leave service for Sudan Government officials from Cairo to London and return. For this purpose a Bristol Wayfarer is being used. The first of these leave services started on August 25th, when Capt. W. T. Mellor, with a crew of four, including an air hostess, left with twenty passengers.

Of the Dakota conversions mentioned, those carried out for K.L.M., in co-operation with Rumbolds, have been very thorough, and the finished aircraft could certainly not be distinguished from any genuine civil-built DC-3. The amount of effort involved in the conversion can be evaluated by an examination of a Dakota in the form in which Airwork receives it. For the K.L.M. aircraft the freight-loading flooring is removed and replaced by a lighter structure; the rear section of the wide double doors on the port side is locked and becomes virtually part of the structure; the navigator's station is cleared to provide additional freight stowage; the entire fuselage is soundproofed; the heating system is redesigned; and the interior is entirely rebuilt and decorated. One of the more difficult jobs, curiously enough, is that of removing the camou-

THE SYSTEM OF THE FLYING CLIPPERS



The United States Civil Aeronautics Board have granted Pan American World Airways the right to establish a "Round the World" service. New routes have been authorized across the Pacific from San Francisco to Calcutta and Sydney, with extensions to link the Pacific Islands with Tokio, Hongkong and Shanghai. These will be operated as soon as landing rights have been obtained by inter-Government agreements, and P.A.W.A. will then be the first airline to operate and carry passengers independent of any other organization on routes encircling the world.

Covering 20,000 miles the flying time for the entire circuit will be approximately 90 hrs. The map shows the main P.A.W.A. routes concerned.

5 SEP 1946

Clayton Evans 251

flage to uncover the bare metal sheen familiar in civil DC-3s. By virtue of careful weight-saving, these K.L.M. Dakotas can be and are being laid out as 21-seaters.

Rather less work is required for the B.O.A.C. conversions, since in these the freight-loading flooring and the navigator's station remain untouched, though the forward bulkhead is arranged to be movable in order to provide varying freightage capacity for special purposes. In this case, too, B.O.A.C. provide their own chair equipment and have laid down the details both of the furnishing and of the interior colour scheme.

Gatwick, where Airwork carry out the bulk of their maintenance and similar work, is still requisitioned. Since pre-war days it has been slightly extended in a northerly direction, so taking in part of the racecourse. The original terminal building—which, in its day, was considered the epitome of modern airport building design—is used for office accommodation. The primary value of Gatwick as a civil airfield lies in the fact that it is actually beside the main London-Brighton railway, with the station actually in the airfield. Though it is a pity that local surface and other conditions do not justify its extension to modern airfield standards, but there seems to be no good reason why, in due course, Gatwick should not be a very useful and convenient charter and private flying centre.



The first civilian Miles Messenger off the production line is seen above being handed over at Heston by Mr. Jack Mayo, of Automobile & Aircraft Services Ltd., who supplied the aircraft, to Wing Commander Hugh Kennard, D.F.C., of Air Kruise (Kent) Ltd. The latter company operates a charter service from Lympne airfield.

SCOTLAND'S OWN ATLANTIC SERVICE ✓

AT the time of going to press it would appear that by now B.O.A.C. will have resumed the trans-Atlantic services with Constellation aircraft. The schedules are at present due to leave London four times a week, and one service, that which leaves London on Wednesday, is due to operate via Prestwick, leaving there the following day for New York. In the east-bound direction the Tuesday service is routed via Prestwick and arrives on Wednesday morning. The majority of seats on the Prestwick service will be at the disposal of Scottish and North of England interests, and the schedules from and to that airport will really constitute special Scottish and North of England services to America. As more aircraft become available, it is B.O.A.C.'s intention to increase the number of services through Prestwick.

FINAL I.C.A.N. MEETING ✓

DELEGATES representing the thirty-three members of the International Commission for Aerial Navigation will meet in Dublin next month for what is expected to be the last annual session of the organization. The field of activity covered by the organization will be absorbed by the International Civil Aviation Organization, when this ceases to be provisional. At the coming I.C.A.N. session air navigation, air traffic control, radio communications, accident investigation, traffic statistics, airfield operation and the standardisation of aircraft and flying crews will be discussed.

AIRBORNE EXHIBITION ✓

A BRISTOL Wayfarer has been specially fitted for exhibiting samples of British manufactured articles, and will leave on October 27th for a European tour under the direction of Mr. Geoffrey Mellor, who has had many years of experience of the Continental market. Stops of two or three days will be made at Copenhagen, Oslo, Stockholm, Gothenburg, Amsterdam, Brussels and Paris, where the prospective buyers will be invited to the airfield to visit the exhibition.

FROM THE CLUBS

UNABLE to return to its own headquarters at Woodford, the Lancashire Aero Club—which is one of the oldest flying clubs in the country—has now started operations from the one-time Manchester Corporation Airport at Barton, near Eccles. Although this airfield has not yet been derequisitioned, the club has the necessary office and other accommodation, and a fleet of three Auster Is. Meanwhile an order has been placed for a fourth aircraft. The pre-war chief instructor, Wing Cdr. W. L. Woodward, is combining the duties of C.I. with those of secretary of the club. The flying rates are £3 an hour, and, with many of the pre-war members still on the active list, quite satisfactory weekly flying totals are being maintained. The club is open on all days except Monday.

At Cambridge, August 18th was by way of being a record day on instructional work for Marshalls. With four aircraft available a total of 42hr 40min were flown. The total for the particular week concerned was 192hr 30min.

BREVITIES

The Ministry of Civil Aviation are considering making Bovingdon Airfield the official bad-weather alternative to London Airport. The airfield is 21 miles from central London.

A Company composed mainly of R.A.F.-trained ex-members of the French Air Force, to be known as Air Transport, has been formed and will operate a new twice-daily air service between London and Lille. The service started on September 1st with Caudron Goeland twin-engined six-seater aircraft. Air France are acting as agents in this country.

P.I.C.A.O. have invited members to discuss arrangements for a network of the thirteen meteorological stations to be situated in the North Atlantic.

Australian National Airways will begin their trans-Pacific air service between Sydney and Vancouver some time in September, operating on behalf of British Commonwealth Pacific Airlines.

The K.L.M. aircraft making a proving flight to South America, on becoming airborne at Buenos Aires on its return journey, sent a routine radio message which was acknowledged by a K.L.M. Skymaster that had just taken off from Batavia.

The third and last Sandringham flying-boat for Tasman Empire Airways left Poole on August 26th for New Zealand. This flying-boat, which is named *New Zealand*, was flown by Capt. H. L. M. Glover.

The Lockheed Servodyne

A Simple Hydraulic Flying Control Assister with Variable "Feel"

CONSEQUENT upon the evolution of the large civil air liner carrying up to 100 passengers, and upon the phenomenal increase of the speed of fighters, the provision of accurate power-operated controls has now become an urgent problem in aircraft design.

For the huge air transports of the immediate future, and for the high-speed types which are gradually approaching the speed of sound, there must be provided responsive controls which the pilot can operate without undue effort. At the same time there must be some retention of "feel."

The reason for all this is basically quite simple. In a very large aircraft the control-surface areas are also large, and the resultant loads as measured in foot-lb are too great for the pilot to move without assistance from some form of mechanical device. The same increase of force is necessary in relatively small aircraft at very high speeds because of the tremendous loads involved when control surfaces are moved at speeds approaching the compressibility barrier. The curve of drag rises sharply, and this implies an output of control moving force of great magnitude.

The movement of quite a small lever, without undue physical effort on the part of the operator, should, therefore, transmit through some form of power multiplier unit the same linear movement without backlash. One method of securing this desirable end is the servo-control.

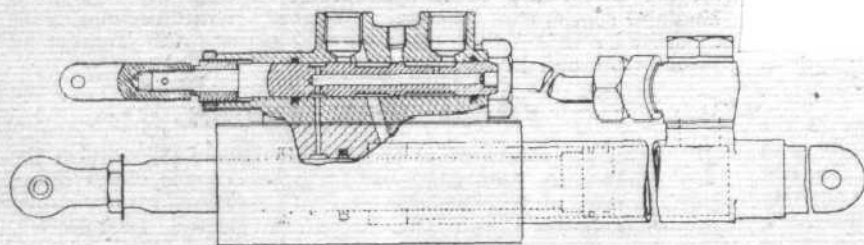
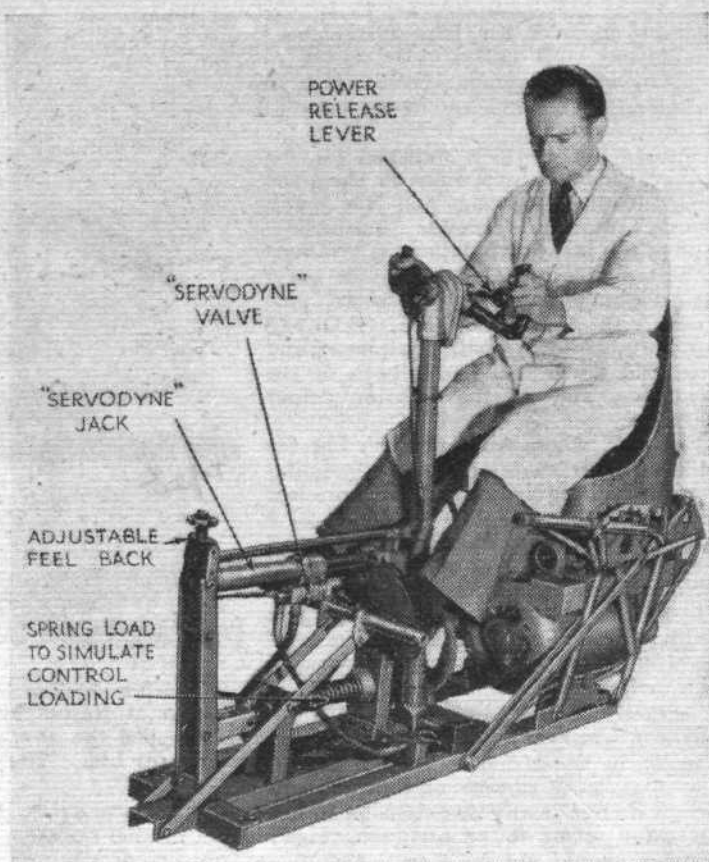


Fig 1. The Servodyne at rest. The pressure on the large side of the jack depends on the external load on the jack.

The application of the hydraulic system of power to the provision of satisfactory servo-controls for large or high-speed aircraft is foreshadowed by the addition to the well-known range of Lockheed hydraulic accessories manufactured by Automotive Products Company Ltd, of a new unit known as the Servodyne, a working model of which will be on view on stand 67 at the S.B.A.C. Exhibition, at Radlett.

From a wide experience on hydraulic controls in many fields, and in particular from the experience of accurate synchronized flap actuation, the company offer the Servodyne as a simple and practical design. As a guide to the best way of applying it, it is not without interest to refer briefly to certain changes that have been found necessary, and the reasons for them. Further, since the fundamental arrangement is not conventional, the reason for its adoption is also given.

A conventional hydraulic jack has two fluid chambers. One is the volume swept by the full area of the piston, and the other is the volume swept by the area of the piston less the area of the piston rod. If the piston rod is chosen to be half the area of the piston, then one swept volume is twice that of the other. If both sides of the piston are subjected to pressure at the same time, the



enter from the pressure element one way, and allowing it to escape to get the opposite movement. Meantime, pressure is applied constantly to the annular or ram-rod side of the piston.

The advantage of this arrangement lies in the simplification of the valve mechanism, which only has to allow fluid to enter or escape from one side of the jack instead of having to provide for change-over of fluid from one side to the other. This reduces complication in the valve mechanism.

Fig. 1 shows the Servodyne system at rest. The pressure on the large side of the jack is dependent on the magnitude of the external load that the jack is supporting. If no load is present, its magnitude is half that of the full input pressure. Fig. 2 shows the jack extending, with full pressure applied to both sides, and Fig. 3 shows the jack contracting, with pressure on the small side only.

During the course of development it has been found

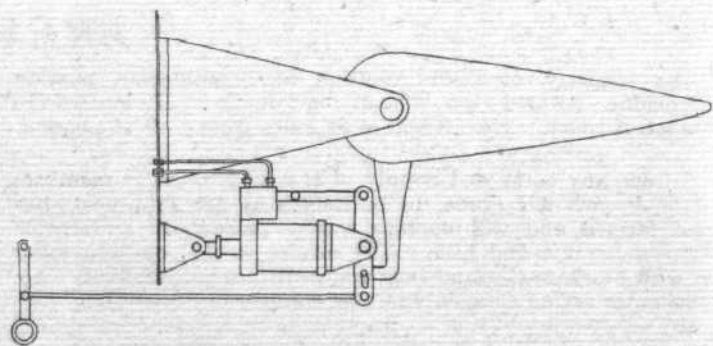
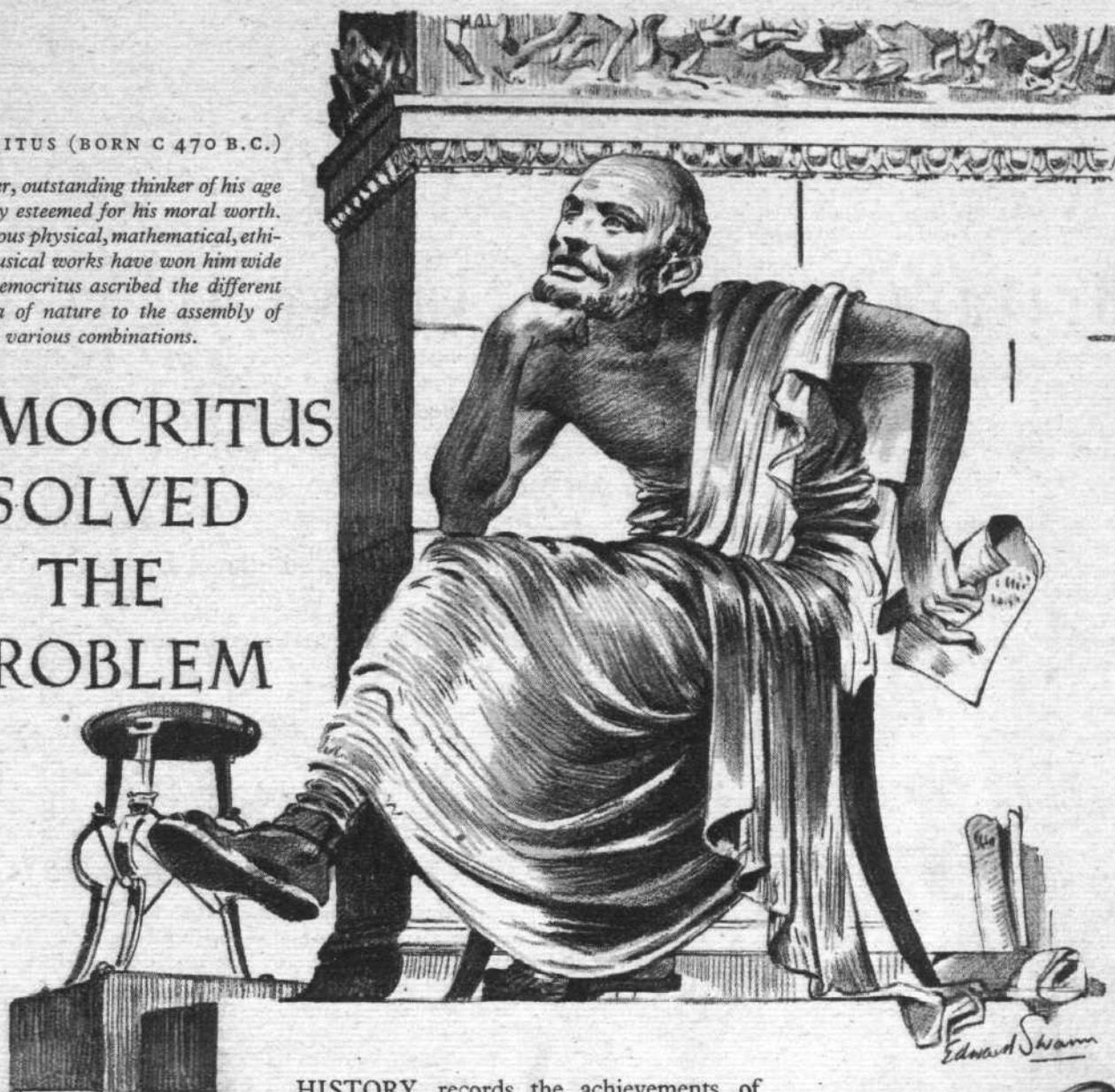


Fig. 2. Diagram of the jack extending, with full pressure applied to both sides.

DEMOCRITUS (BORN C 470 B.C.)

Philosopher, outstanding thinker of his age and greatly esteemed for his moral worth. His numerous physical, mathematical, ethical and musical works have won him wide respect. Democritus ascribed the different phenomena of nature to the assembly of atoms into various combinations.

DEMOCRITUS SOLVED THE PROBLEM



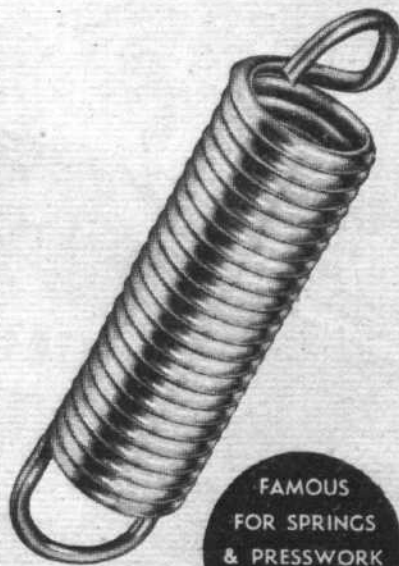
HISTORY records the achievements of the ancients, but it is often forgotten how much our modern machine age owes to seemingly small inventions. But for the Spring the internal combustion engine, as we know it, would not be possible. Whilst in the home even the door handle depends on springs. The history of spring development is so closely allied to the history of Terry's as to be practically inseparable. For over 90 years Terry's Research Department has been specialising in the development and manufacture of springs and has pioneered every important advance in design. If you have a spring problem we shall be pleased to co-operate in solving it.

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A P R O D U C T O F T H E R O O T E S G R O U P

THE LOCKHEED SERVODYNE

necessary to reduce the losses and operating loads to the very minimum possible. Originally a control valve of the opposed-poppet type was used, and this valve, as shown in Fig. 4, provides extremely sensitive control without working to close tolerances.

In practice, movements of less than 1/1,000th of an inch are sufficient to obtain motion in either direction. On the other hand, the design involves the use of springs to hold the valves on their seats, and it has been found that these loads, even though small, are not acceptable. Therefore, a piston-type slide valve, as shown in Figs. 1, 2 and 3, has been substituted, its design being based on the injection-pump technique developed for the manufacture of the pumping elements of the Mark VI Pump. By this means piston overlaps of less than 0.005in have been successfully used. These, whilst not fundamentally as accurate as the previous

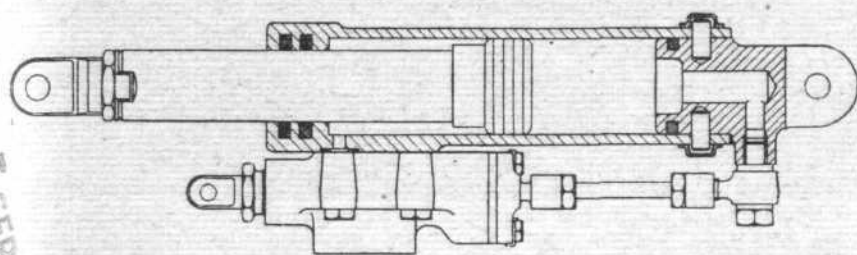


Fig. 3. The jack contracting, with pressure on the small side only.

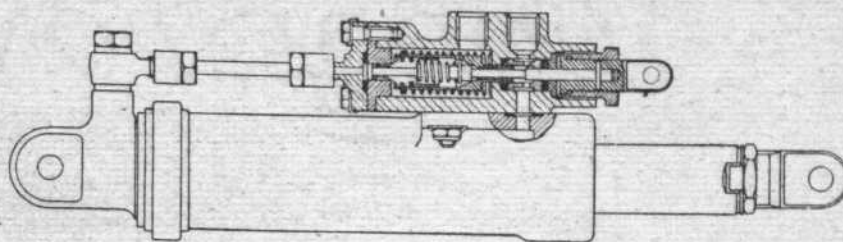


Fig. 4. The opposed-poppet type of valve provides extremely sensitive control and was used originally, but it has now been replaced by a piston-type slide valve.

design, are, nevertheless, of an order which cannot be detected manually.

The application of the Servodyne to a control is a simple matter, involving only the interruption of the control-run at one point, and the provision of a reaction point on the airframe adjacent to it.

It was recognized early in the development of the Servodyne that a measure of "feel back" would be required.

This "feel back" can be defined as a percentage of the operating load that it provided manually. Initially it was provided by adjusting areas of the valve mechanism to give out-of-balance reaction, but it was found that this arrangement could not readily be altered to suit individual requirements, and an alternative method was adopted. In this arrangement, however, the relative position of the attachment point of the control load determines the percentage of "feel back," which can be varied, if necessary during operation, from 0 to 100 per cent.

The Auxiliary Air Force ✓

Honorary Air Commodores and Commanding Officers Appointed

SOME months ago the Government stated its intention to re-establish the Auxiliary Air Force and gave an outline of its composition and organization. The Air Ministry has now announced the officers appointed to command 16 of the 20 A.A.F. squadrons. In the list below we give first the number and name of each squadron, followed by the name of the Honorary Air Commodore and the Commanding Officer.

500 (County of Kent): Air Comdre. The Rt. Hon. Anthony Eden, M.C., M.P.; Sqn. Ldr. Patrick Green, O.B.E., A.F.C.

502 (Ulster): Air Comdre. The Most Hon. Marquess of Londonderry, K.G., P.C., M.V.O., T.D.; Sqn. Ldr. W. H. McGiffin.

504 (County of Nottingham): Air Comdre. The Rt. Hon. Lord Mottistone, P.C., C.B., C.M.G., D.S.O.; Sqn. Ldr. A. H. Rook, D.F.C., A.F.C.

600 (City of London): Air Comdre. The Rt. Hon. Sir Archibald Sinclair, Bt., K.T., C.M.G.; Sqn. Ldr. T. N. Hayes, D.F.C.

601 (County of London): Air Comdre. The Rt. Hon. Lord Riverdale, G.B.E., J.P., LL.D.; Sqn. Ldr. The Hon. Max Aitken, D.S.O., D.F.C., M.P.

602 (City of Glasgow): Air Comdre. His Grace The Duke of Hamilton and Brandon, P.C., G.C.V.O., A.F.C.; Sqn. Ldr. M. Robinson, A.F.C.

603 (City of Edinburgh): Air Comdre. Sir W. Y. Darling, C.B.E., M.C., D.L., J.P., M.P.; Sqn. Ldr. G. K. Gilroy, D.S.O., D.F.C.

604 (County of Middlesex): Air Comdre. The Rt. Hon. Viscount Templewood, P.C., G.C.S.I., G.B.E., C.M.G., D.L., J.P.; Sqn. Ldr. J. Cunningham, D.S.O., D.F.C.

607 (County of Durham): Air Comdre. The Hon. W. L. Runciman, A.F.C.; Sqn. Ldr. J. R. Kayll, D.S.O., D.F.C.

609 (West Riding): Air Comdre. The Rt. Hon. The Earl of Harewood, K.G., G.C.V.O., D.S.O., T.D.; Sqn. Ldr. P. A. Womersley, D.F.C.

610 (County of Chester): Air Comdre. Sir Wm. Bromley Davenport, K.C.B., C.M.G., C.B.E., D.S.O., T.D.; Sqn. Ldr. P. G. Lamb, A.F.C.

611 (West Lancashire): Air Comdre. G. L. Pilkington; Sqn. Ldr. W. J. Leather, D.F.C.

612 (County of Aberdeen): Air Comdre. Sir Ian Forbes-Leith, Bt.; Sqn. Ldr. R. R. Russell.

613 (City of Manchester): Air Comdre. The Rt. Hon. The Earl of Derby, K.G., P.C., G.C.B., G.C.V.O., T.D.; Sqn. Ldr. J. S. Morton, D.F.C.

615 (County of Surrey): Air Comdre. The Rt. Hon. Winston Churchill, O.M., C.H., M.P.; Sqn. Ldr. R. G. Kellett, D.S.O., D.F.C.

616 (South Yorkshire): Air Comdre. His Grace The Duke of Portland; Sqn. Ldr. K. Holden, D.F.C.

The names of officers appointed to command the remaining four A.A.F. squadrons will be issued later. Their Honorary Air Commodores are: No. 501 (County of Gloucester), Air Chief Marshal H.R.H. The Duke of Gloucester, K.G., P.C., K.T., K.P., G.C.B., G.C.M.G., G.C.V.O.; No. 605 (County of Warwick), Sir Wm. Lindsay Everard, D.L., J.P.; No. 608 (North Riding) The Rt. Hon. Viscount Swinton, P.C., G.B.E., C.H., M.C.; No. 614 (County of Glamorgan), R. Cadman, D.L.

When the individual squadrons are ready to deal with applications from recruits (who must be officers and men who have served with the Royal Air Force) further announcements will be issued from time to time through the Press.

✓ A.T.A. FUND

AN estimate of needs calculated at £26,000 for the A.T.A. Benevolent Fund was quoted in the treasurer's report at the fifteenth meeting of the fund's general committee. The report added that other cases had since arisen, but it was confidently believed that the fund would be found to have sufficient money to meet its liabilities.

CORRESPONDENCE

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

AN APPRECIATION Wartime Difficulties in India

I MUST say, having seen "Gas Turbines and Jet Propulsion" (and the previous third volume) that it is a very fine effort. As this is yet another British invention, I feel that you should have been allowed the finest paper, even parchment, to record one of our finest examples of British free enterprise, sadly being sunk under a dead weight of "forms."

I have been a member of the aircraft industry for the past twelve years and started to read *Flight* when I was 13. Once again I must say what a wonderful job you have done and full marks for your "war effort." As a "civvy" in India trying very hard to help set up an aircraft "industry" during the war, you have no idea how welcome copies of *Flight*, even a month old, were, to keep us in touch with what was new at home. It might amuse you to know what we were able to do by scaling drawings of aircraft from your journal. More than once we were informed that such a type was coming in for repair or modification and without drawings, the only way we could arrange hangar accommodation was to scale in my drawing office the drawings out of your journal. Certain members of the staff got decorations from the Indian Government, but we all felt that a special "gong" should have been struck for you. It was amazing to me as a draughtsman that we could scale from your drawings such items as a centre section to within a couple of inches. Every time I made statements that we could get, say, a dozen components in a certain space my heart was in my mouth, knowing how I got the gen, but you never let us down. D. J. STRACHAN.

SAFETY FIRST

Grim Prospects and How to Avoid Them

YOUR editorial in *Flight*, Aug. 15th, under the heading "Safety First" has prompted me to write. I do so as an ordinary member of the community (who will probably never fly and use London Airport—only the wealthy can fly, still!), but who lives near the "great" London Airport (about two miles S.S.W.).

First, may I recount an experience at 2.30 a.m. about a week ago? It was a particularly dirty night—it rained heavily all night—and the cloud base was about 600ft. However, at the said 2.30 a.m. I was awakened by the roar of a Skymaster, flying over the house at certainly no more than 500ft. I am, by the way, a very heavy sleeper, so it must have been very low to wake me.

You might say, "Well, so what? Planes must come down to land!" That, of course, is true, but, in good visibility, planes for London Airport always pass over our house at between 2,000 and 2,500ft, as they still have about a 220 degree turn to make before straightening out to land.

Judging from this experience of mine (and your editorial), plus a little foresight, we can expect to pick up our papers one morning during next winter and read "A giant airliner crashed into and wrecked three houses at — near London Airport, when landing in bad weather last night. All the passengers and crew, and all except three of the occupants of the houses were killed. The houses were completely demolished, and damage done to several nearby." We might also read, "Two giant airliners collided in mid-air last night during bad weather. All passengers and crews were killed, and considerable damage was done to two houses at — upon which the remains of one of the aircraft fell, killing all occupants of one house and severely injuring those of the other. One liner was waiting to land at London Airport, and the other, it is believed, was trying to land at Northolt. An enquiry is to be held."

The thing which amazes me most, about London Airport, is that there is not a ring of lights round it, visible from the air, as was the practice at R.A.F. airfields during the war. Surely the London Airport should have this aid?

In my humble opinion (incidentally, as a member of the Royal Observer Corps during the war I had fair opportunity of studying both day and night flying, from the observer's point of view) there should be two rings of lights round London Airport. First, there should be an outer ring at five miles' radius, using powerful sodium lamps—one for normal visibility, and up to six, if necessary (on each post) for fog and loud use. Then there should also be an inner ring at

two miles' radius, using blue mercury vapour lamps, but in the same proportion as the amber.

Each post on, at least, the outer ring should have some form of strong radar reflecting plates with which aircraft with radar could pick up the circle. At eight-mile radius five equally spaced observer posts should be set up; each post to be basically similar to R.O.C. posts, i.e., to have R.O.C. plotting tables and instruments; proper protection for the observers; proper optical equipment, both binoculars and a telescope ($\times 25$ mag.)—the telescope to be mounted on a rigid universal mounting; two-way telephone to control tower. The post end must have a loudspeaker, and not 'phones only (as was the stupid R.O.C. practice during the war) so that both observers can hear what control is saying. The post should also have two-way R/T. so that the observers can (in bad weather), when hearing an aircraft overhead, tell that aircraft to circle over the post until control wants it to land.

For the actual landing all or any of the approved systems could be used. In addition, the post could be fitted with some form of controlled reflector (in the form of letters of the alphabet, for example, and perhaps radio-operated) so that a circling aircraft fitted with radar would not drift.

The operation of the light rings could be by relays, to save heavy wiring from control, using G.P.O. lines—if they have any to spare these days!

May I reiterate, from R.O.C. experience, that, whilst appreciating the wonders of radar, it lacks the direct human contact which the observer has, always will have, and which, in my opinion, will never be exceeded by any man-made mechanical or electronic gadget.

There are two elaborations which could be used in addition to the above. First is application of radar to the plotting instrument sights for fog use, and, secondly, a parallel line of posts eight to ten miles wide (with radar reflectors) on the main trunk routes.

May I conclude by thanking you for all the interesting articles, etc., in your excellent paper, and by asking you to use all the influence you can to apply your "Safety First" campaign? H. E. NORMAN.

ENCOURAGEMENT FOR FOOLS

Proposed Organization for "Sport Flying"

I READ "Encouragement for Fools," by Ristead MacRoibin (*Flight*, August 22nd) with great interest; interest which, I am sure, is shared by so many other "fools" that I would like to intrude upon your valuable space to suggest that those keen on amateur construction get together now with a view to taking the matter a step further than suggested by Mr. MacRoibin.

While it is agreed that the present is not a good time to tackle the authorities about the future of sport-flying, I suggest that those interested should not be content to sit back awaiting a more opportune moment in which to press their case, hoping that in the meantime "a group of experts with a practical knowledge of aeronautics" will produce a "tested and approved design." On the contrary, I believe that we should get together now to form a club, society, association—call it what you will—whose general aim will be to promote the well-being of this sport-flying business, and whose immediate object will be to start a fund for the purpose of financing the design, construction and testing of a machine which can be built by the amateur. Other objects might well include the production of working drawings of such a machine for sale to members of the organization at a nominal figure and the provision of approved inspection facilities for those building to the approved design.

Having produced the design, and made available these other facilities, the suggested organization (as representative of the amateur constructor) would be in a good position, when the time arose, to present to the appropriate Government department a case for revision of the C. of A. regulations in so far as they affect fine weather fun-flying. It is certain, at least, that such an approach to the authorities would stand a much greater chance of success than would be the case were each individual amateur to attempt to obtain approval for his own private design.

Should Mr. MacRoibin or any other readers be interested in my suggestions, perhaps they would get in touch with me.

R. W. CLEGG.



The Republic Seabee RC3 is an attractive, light, four-seater amphibian which has inspired great interest in America and elsewhere. It is both cheap and economical. It has a 215 h.p. Franklin engine.

The Seabee Amphibian

Re-design for Simplicity of Structure Achieves Exceptionally Low Production Cost : Economical Four-seater for the Private Owner

AN outstanding reduction in production cost and man-hours has been effected by the Republic Aviation Corporation of America in connection with their light amphibian, the Seabee. Large-scale production of this little four-seater has started at Farmingdale, Long Island, and plans provide for an output of 40 Seabees per day by the beginning of next year. Figures for man-hours, numbers and cost are quite outside the limits of anything to which we are accustomed in this country. The cost of approximately £1,000 is extremely low, and the ultimate production time of 200 man-hours is scarcely credible.

The prototype three-seater with tapered wings which appeared in November, 1944, was quite conventional in construction. In this form the Seabee comprised 1,800 airframe components; some 2,500 man-hours were required to build the airframe; and the cost of manufacture

was estimated at about \$7,500. The present figures, for comparison, are given as 450 components, 200 man-hours and \$3,995 cost. The airframe weight has been reduced from 1,260 lb to 1,140 lb. The increase in power output and reduction in engine cost has also been quite striking since the purchase of Aircooled Motors brought the Franklin engine under development by the Republic Company. Originally a 175 b.h.p. unit, the latest flat-six Franklin delivers 215 h.p. What is, perhaps, more important in the case of a small aircraft for private ownership, the cost has been reduced from 30s per h.p. to 20s, and there is good reason to believe that the figure may later be reduced still more to about 15s per h.p. Incidentally, it has wet-sump lubrication and a fuel consumption of 13.5 gal/hr.

When the radical redesign of this Seabee prototype was tackled by Mr. Alfred Boyajian and his staff, structural simplicity was the main aim, man-power being the expensive item. In view of the great difference in material properties, the similarity in structure of the old-type wood and fabric wing and the modern all-metal wing seemed remarkable to the re-design staff, and it was sug-



Of particular interest to American family men is the Seabee's ability to 'take off' inland from the home airport and land at a coastal or lakeside resort. The aircraft is sturdy and for experiment has been landed wheels-up on land with, it is said, only superficial damage.

British Combine Photos.

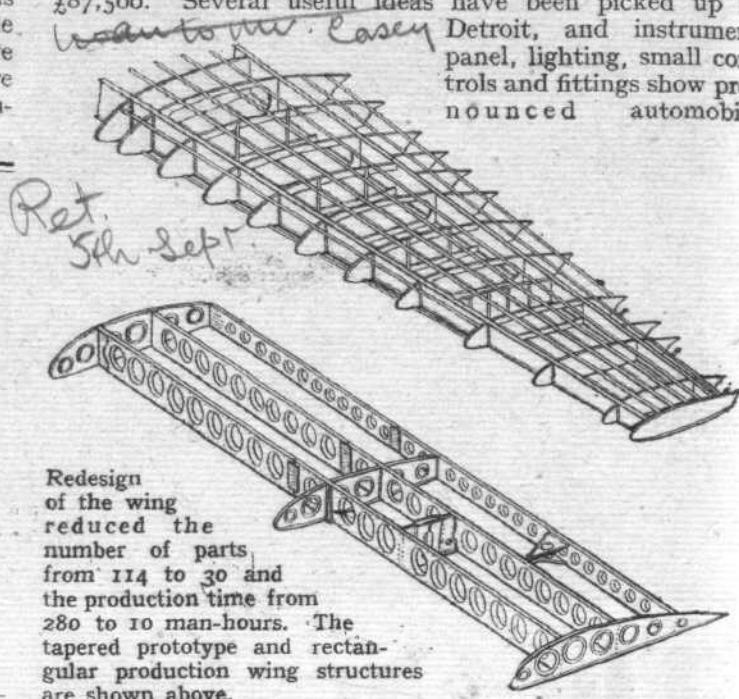
THE SEABEE AMPHIBIAN

gested that if the skin were to be sufficiently stiffened, much of the load could be transferred to the spars through a torque-box structure, and as a result many of the ribs or other stiffening members could be eliminated. This theory has been successfully and thoroughly applied to the Seabee, and a rather revolutionary light aircraft structure has resulted. The multi-ribbed external skin surfaces are somewhat reminiscent of earlier Junkers corrugated construction.

REPUBLIC SEABEE AMPHIBIAN Model RC3. Franklin 6A8-215-B8F engine.

Performance			
Maximum speed	...	...	120 m.p.h.
Cruising speed (75 per cent power)	...	...	103 m.p.h.
Landing speed	...	...	58 m.p.h.
Initial climb	...	...	700ft/min
Cruising range	...	...	560 miles
Take-off on land (full load)	...	...	800ft
" on water (,, ,)	...	...	1,000ft
" time (on water)	...	...	25 sec
Landing run (on land)	...	...	400ft
" " (on water)	...	...	700ft
Weights			
Gross	...	...	3,000 lb
Empty	...	...	1,950 lb
Useful load	...	...	1,050 lb
Baggage allowance with pilot, passenger and 75 gal of fuel	...	...	240 lb
Baggage allowance with pilot, 3 passengers and 45 gal of fuel	...	...	80 lb
Dimensions			
Span	...	...	37ft 8in
Length	...	...	28ft
Height	...	...	9ft 7in
Track	...	...	8ft
Draught (loaded)	...	...	18in

As a further means of reducing production costs, and because a run of 3,500 to 5,000 aircraft is planned, the possibility of using automobile tooling methods was explored. According to our American contemporary *Aviation*, such tooling for a run of 5,000, assuming a "frozen" design, was estimated at \$300-350 per lb of airframe, which for a weight of 1,100 lb is approximately \$350,000 or £87,500. Several useful ideas have been picked up in Detroit, and instrument panel, lighting, small controls and fittings show pronounced automobile



The prototype Seabee, which was completed at the end of 1944, is seen to differ considerably from the production aircraft. Engine nacelle, tapered mainplane, more rounded tail units with smooth skin, and nose profile, are differences apparent in this photograph.

influence and, in fact, are in some instances selected automobile components.

Externally an indication of the change of structure is the rectangular wing with ribbed skin and the ribbed tail surfaces. Skins are pressed in unusually large sections, and at present temporary tools are used. Later the rubber dies will be replaced by all-steel tools.

The Main Planes

The main wing unit is a rectangular, constant-thickness structure composed of thirty sub-components and weighing 130 lb. The skin panels are of the wrap-round type, riveted heavily at the trailing edge but more lightly elsewhere to the supporting frame, which comprises three spars and three ribs. On assembly, the inboard end rib is first riveted to the front main spar, and this structure is then placed in the corrugated skin envelope produced in the press in two sections and pre-riveted. The skin is next riveted to the front spar and end rib from the open edge. The third operation is the addition of the other spars and ribs, and the unit is finished-off by welding the trailing edges of the envelope which form an external flange.

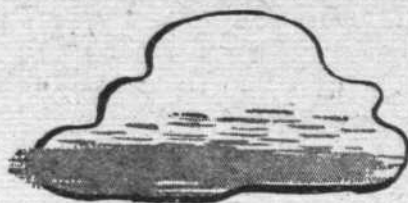
Only 882 rivets are required as compared with 2,627 in the prototype wing. The number of parts was originally 114 and the weight 150 lb; these figures are now 30 and 110 respectively.

The advantages resulting from the use of a simplified rectangular wing as opposed to the tapered variety are listed below. It is not clear why the tailplane was not made rectangular during the re-design in order to benefit from similar advantages.

(1) The skin is a rectangular sheet and there are no material losses in preparing it for assembly.

(2) A single forming tool can be used for all skin sections of both left and right planes.

Rev. 5.9.46
P. J. H. W. Perry



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Differential Pressure Gauge Tester

Patents Pending

Designed in the first place for testing Boost Gauges, the apparatus illustrated can be used for testing almost any type of low-pressure or vacuum gauge.

It is a compact, self-contained and strongly constructed portable unit, weighing 26 lb. The overall dimensions are : 12 ins. x 11½ ins. x 5½ ins.

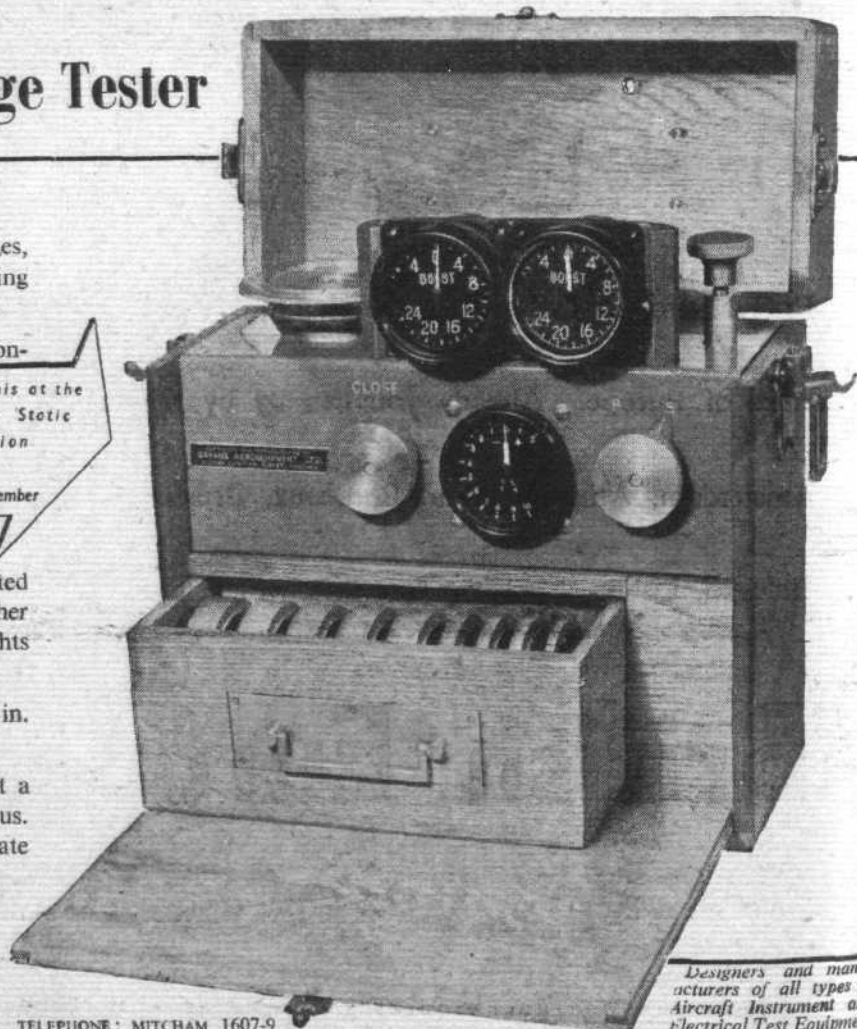
The tester is simple to use ; a single control governs the change over from positive to negative pressures.

Positive pressures up to 60 lb. per sq. in. are indicated on a dead-weight apparatus, and where higher pressures than this are required, additional weights can be supplied to extend the range.

The negative pressure range down to 10 lb. per sq. in. is sufficiently low for most purposes.

All vacuum gauges under test are checked against a sub-standard gauge supplied with the apparatus. Alternative panels are provided to accommodate different standard case diameters.

See this at the
S.B.A.C. Static
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(3) A single tool can be used for fabricating spars in left and right main-planes.

(4) Strip stock of exact width can be used for the spars.

(5) Flaps, ailerons and their attachment fittings are interchangeable left and right.

A similar story can be told of the hull which, from an elaborate "egg-box" structure of 362 components and weighing 318 lb, has been transformed into a simple 63-part unit weighing 298 lb. The man-hour saving is 570.

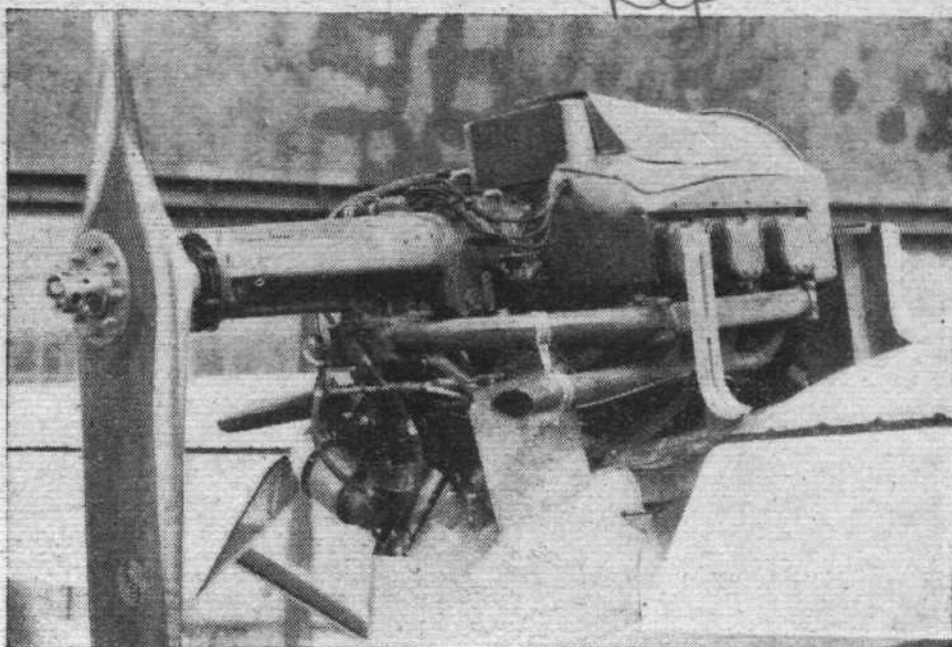
A monocoque wing-tip float produced from two pressings riveted along outward-turned flanges is another example of simplicity and time-saving by comparison with conventional construction.

Interior Design

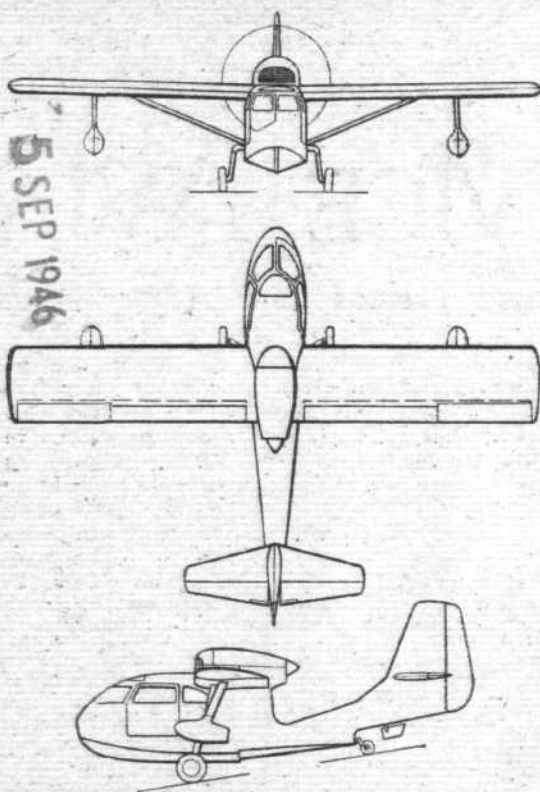
The cabin, which seats four (or by folding the seat back sleeps two) is intelligently planned and equipped. All instruments are grouped in front of the pilot on the port side and are mounted on two separate panels, quickly removable as units. One panel carries engine instruments of automobile design and the other the flight instruments. Built-in two-way radio for Range and control is also a standard fitment. Alternative flight panels and radio units are available and interchangeable according to individual requirements. Production installation time for all electrical wiring is only eleven minutes.

Adjustable seats are fitted with backs that are detachable for use as substitute life jackets in emergency and in addition to the two normal doors, a large bow door is provided on the port side. To give access to this door no panel is fitted in front of the left passenger seat.

The landing wheels and tail wheel are hydraulically retracted, a hand



The flat-six engine is neatly cowled and accessible, and the mounting is particularly simple. The wooden fixed-pitch-type airscrew will not be fitted on production Seabees.



pump being placed between the front seats. Indicator lights are provided.

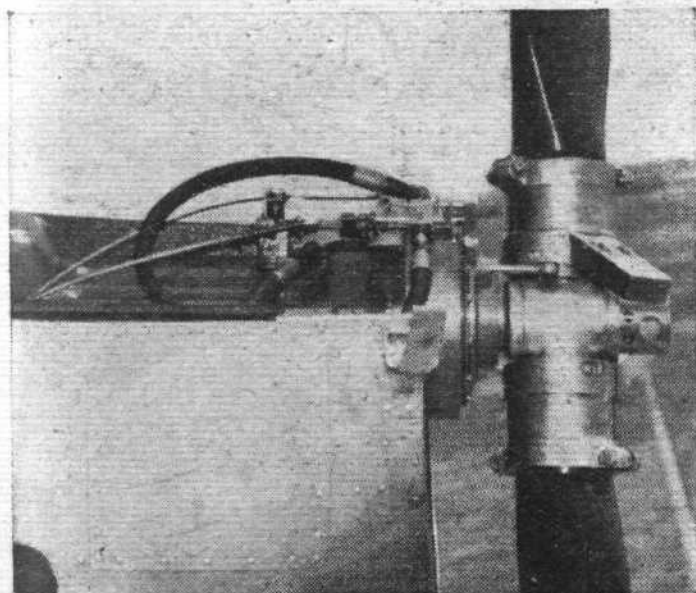
A rubber-impregnated, fabric-bag type fuel tank is employed. This rests on a plastic sheet on the hull bottom and is located in a watertight compartment between bulkheads just forward of the main step.

A detailed study of Seabee design and construction will appear in the October issue of our associated journal *Aircraft Production*.

Preliminary construction was examined by a member of *Flight's* staff during a recent visit to Farmingdale, N.Y. Fourteen Seabees had been constructed at that time (July) and it was anticipated that in all 120 would be made partially or en-

tirely by hand before tooling-up was complete. The first year's production figure was estimated at 3,500 aircraft.

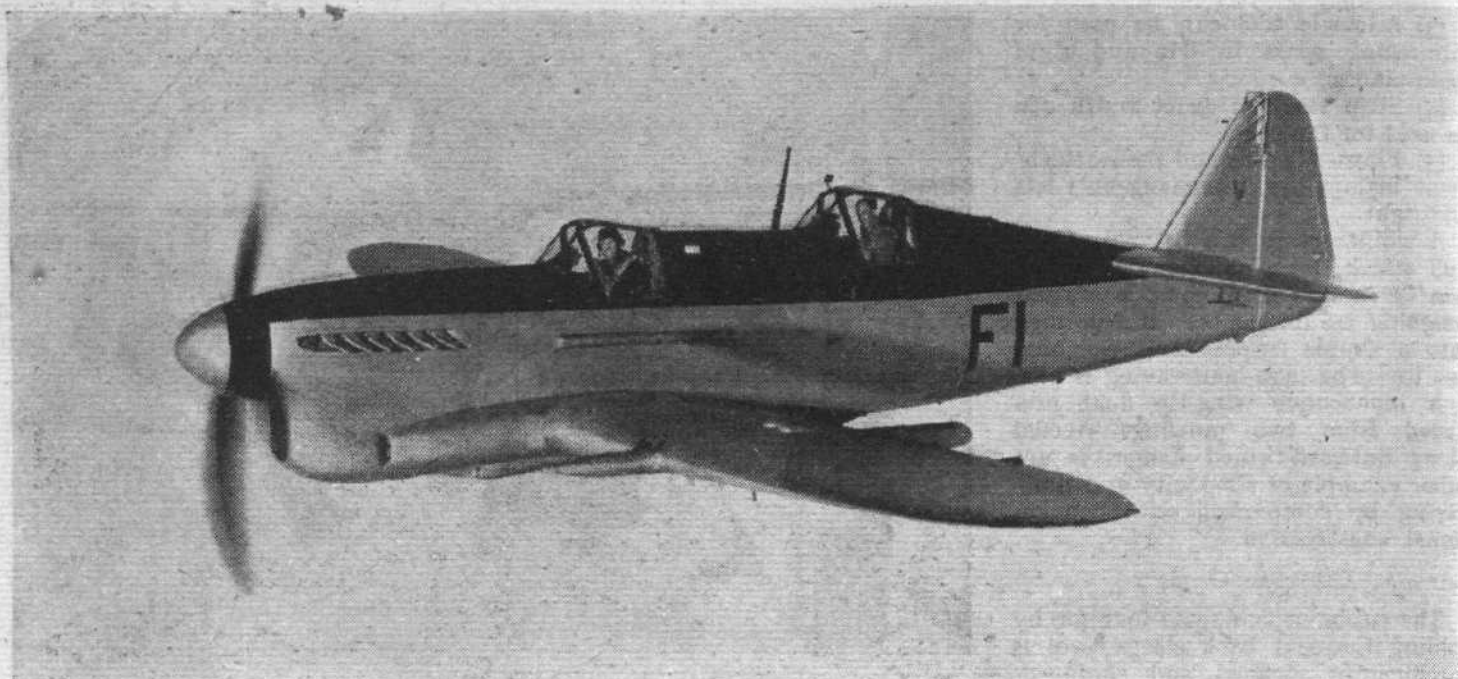
A pusher airscrew, adjustable on the ground for pitch, is carried on a short extension shaft from the 215 h.p. Franklin engine.



FORTHCOMING EVENTS

- Sept. 7th-8th.—International Air Rally (Ghent Aviation Club), St.-Denis-Westrem-Gand, Belgium.
- Sept. 8th.—Brentford and Chiswick Model Flying Club Gala Day, Hounslow Heath.
- Sept. 9th.—Ministry of Civil Aviation demonstration of technical radio equipment begins.
- Sept. 10-13th.—F.A.I. Conference, London. (Delegates to be guests of the R.Ae.C.).
- Sept. 12th-13th.—S.B.A.C. Exhibition and Flying Display, Handley Page Airfield, Radlett, Herts.
- Sept. 15th.—R.Ae.S. Garden Party, Handley Page Airfield, Radlett, Herts.
- Sept. 17th.—Air trip to Jersey for junior members of Air League.
- Sept. 22nd.—"Danish Flying Day." (Invitation from Danish Clubs.)
- Sept. 26th.—Glasgow Branch of R.Ae.S. "lecturette" meeting, Prestwick Airport, 7.30 p.m.

5 SEP 1946



TRAINING SHIP: The prototype of the new dual-control trainer version of the Fairey Firefly Mk. I Naval fighter-reconnaissance aircraft. It will be seen that fixed guns are retained. A Rolls-Royce Griffon XII engine gives a top speed of slightly more than 300 m.p.h.



SERVICE AVIATION



Royal Air Force and Naval Air Arm News and Announcements

Meteor for Whitehall?

WHEN a new world's air speed record is established by the High-Speed Flight a Gloster Meteor IV fighter will be exhibited in Whitehall.

Airspeed Ayrshire

THE name Ayrshire has been allotted to the military transport development of the Airspeed Ambassador air liner. Bearing the works designation A.S.60, the Ayrshire has two Bristol Centaurus engines. Gas turbines may eventually be fitted. Ease of loading has been a major design consideration, but should not greatly impair the excellent performance characteristics attributed to the Ambassador. Doors on each side of the fuselage provide exits for parachute troops.

Battle of Britain Celebrations

IN celebration of the sixth anniversary of the Battle of Britain, over 60 stations of all R.A.F. Commands will be "at home" on September 15 to the general public. Exhibits and facilities will vary from station to station, but living accommodation, workshops and the different sections of each station will, generally speaking, be open to visitors. This will be of particular interest to those who are thinking of making the R.A.F. their career, though stations will be improved considerably during the next few years when the plans for post-war accommodation and amenities generally are brought into effect. When carried out these will make the living quarters and recreational facilities for airmen and their wives, and for airwomen, comparable with those in civil life.

Visitors will also be able to see aircraft equipment, armament, navigation instruments, etc., and, where it is possible to arrange it, demonstrations of parachute packing, engine running on test benches, supply dropping and firing at the stop-butts. As the R.A.F. will be host at these stations there will be no charge for admission.

The stations to be open are:—

STATION	TRANSPORT COMMAND	NEAREST TOWN	COUNTY
Upper Heyford	Bicester	Oxford	
Stoney Cross	Southampton	Hants	
Hendon	Colindale	Middlesex	
Oakington	Cambridge	Cambridgeshire	
Waterbeach	Cambridge	Cambridgeshire	

Lyneham	Swindon	Wilts
Holmsley South	Bournemouth	Hants
Honington	Bury St. Edmunds	Suffolk
Newton	Nottingham	Notts
Ternhill	Market Drayton	Shropshire
South Cerney	Cirencester	Glos.
Little Rissington	Cheltenham	Glos.
Wellesbourne	Stratford	Warwick
Mountford	Chippenham	Wilts
Hullavington	Rugby	Warwick
Church Lawford	Grantham	Lincs.
Spitalgate	Louth	Lincs.
Manby	Shrewsbury	Shropshire
Shawbury	Ramsey	I. of Man
Jurby	Downpatrick	Co. Down, N.I.
Bishops Court	Newcastle	Northumberland
Custom	Beverley	E. Yorkshire
Leconfield	Marlow	Bucks
Booker		



SPITFIRE 24: A new view of the latest (Mark 24) version of the Supermarine Spitfire, a 460 m.p.h. general-purpose land fighter which is among the world's fastest airscrew-driven machines. As in the Seafire opposite, the engine is a Rolls-Royce Griffon.

5 SEP 1946

TECHNICAL TRAINING COMMAND		
STATION	NEAREST TOWN	COUNTY
Debden	Saffron Walden	Essex
Halton	Aylesbury	Bucks
Kirkham	Preston	Lancashire
Locking	Weston-super-Mare	Somerset
Melksham	Melksham	Wilts
Madley	Hereford	Herefordshire
St. Athan	Cardiff	Glamorgan
Weeton	Preston	Lancashire

BOMBER COMMAND		
Coningsby	Lincoln	Lincs.
Waddington	Lincoln	Lincs.
Lindholme	Doncaster	Yorkshire
Hemswell	Gainsborough	Lincs.
Upwood	Huntingdon	Hunts.
Marham	King's Lynn	Norfolk
Moreton-in-Marsh	Gloucester	Gloucestershire
Silverstone	Towcester	Northants
North Luffenham	Oakham	Rutland
Cottesmore	Oakham	Rutland
Swinderby	Lincoln	Lincs.
Finningley	Doncaster	Yorkshire

FIGHTER COMMAND		
Horsham St. Faith	Norwich	Suffolk

COASTAL COMMAND		
St. Eval	Wadebridge	Cornwall
Leuchars	Fife	Fife
Aldergrove	Crumlin	Co. Antrim, N.I.

MAINTENANCE COMMAND		
216 M.U. Sutton Coldfield	Birmingham	Warwickshire
3 M.U. Milton	Abingdon	Berks.
7 M.U. Quedgeley	Gloucester	Gloucestershire
51 M.U. Lichfield	Lichfield	Staffs.
57 M.U. Wig Bay	Stranraer	Wigtownshire
272 M.U. Killadeas	Enniskillen	N. Ireland
273 M.U. Polebrook	Peterborough	Northants.
274 M.U. Swanington	Norwich	Norfolk
20 M.U. Aston Down	Stroud	Gloucestershire
29 M.U. High Freall	Wellington	Shropshire
44 M.U. Edzell	Brechin	Angus
48 M.U. Hawarden	Chester	Cheshire
13 M.U. Henlow	Hitchin	Herts.
32 M.U. St. Athan	Cardiff	Glamorgan
24 M.U. Ternhill	Market Drayton	Shropshire
213 M.U. Greenock	Glasgow	Renfrewshire
84 M.U. Mount Batten	Plymouth	Devon

Greek Decorations for R.A.F. Officers

AT the Greek Embassy on August 27th the King of the Hellenes conferred Greek decorations on the following Royal Air Force officers:—

GRAND CROSS OF THE ORDER OF THE PHOENIX:— Air Chief Marshal Sir J. Slessor.

KNIGHT COMMANDER OF THE ORDER OF GEORGE I:— Air Marshal Sir L. H. Slatter.

KNIGHTS COMMANDERS OF THE ORDER OF THE PHOENIX:— Air Vice-Marshal E. B. C. Betts and Air Vice-Marshal F. F. Inglis.



RECREATIONAL: Dedicated to the memory of the late Wing Commander H. G. Malcolm, V.C., No. 12 Malcolm Club, at Gatow, Germany, is typical of sixteen clubs now functioning in the British zone. The building, which was originally the *Luftwaffe* Officers' Mess has a lounge-hall, a canteen seating 300, bar, reading room, library, waiting-room, games room and barber's shop.

COMMANDER OF THE ORDER OF GEORGE I:— Air Commodore H. D. Jackman.

Bristol 170—Military Version

SOME interesting data have been issued concerning a proposed military version of the Bristol 170 Freighter. This machine, with two Hercules engines, has a normal all-up weight of 37,000 lb and an overload weight of 39,500 lb. With 600 gallons of fuel the useful loads are 8,750 lb and 11,252 lb respectively.

Typical loads are: 3-ton Fordson; Austin truck; Bedford truck; two 15-cwt trucks; 15-cwt truck with trailer; 15-cwt. truck, 25-pdr gun and two men; 17-pdr gun, 40 rounds and six men; 40-mm. A.A. gun; tractor caterpillar; caterpillar grader 33; 32 stretcher cases and six attendants.

Hastings Christening

THE RT. WORSHIPFUL THE MAYOR OF HASTINGS (Councillor F. W. Chambers, O.B.E., J.P.) was due to perform the christening ceremony of the Handley Page Hastings at Radlett on Wednesday, September 4th. The Hastings is the largest and fastest R.A.F. transport aircraft.

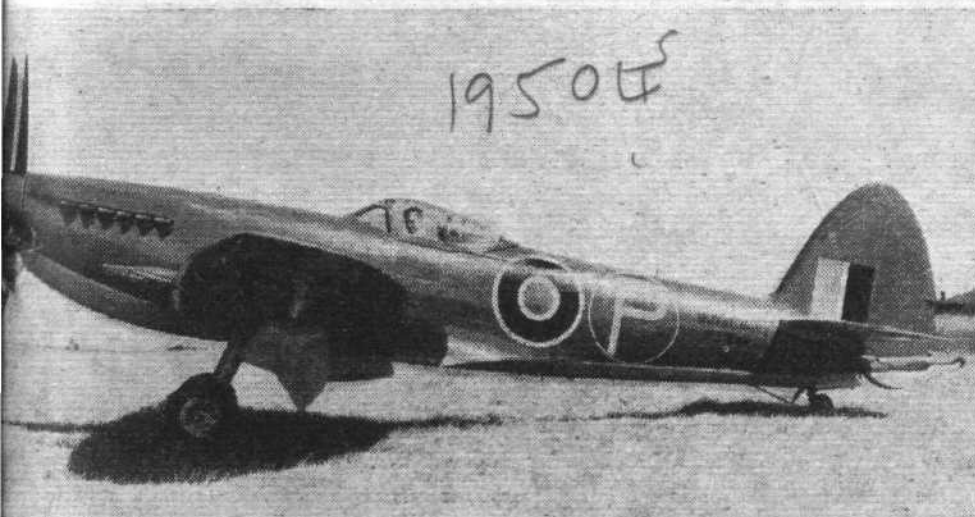
Science in Singapore

EVERY night a small group of scientists in Singapore is able to hold a consultation with colleagues in England and exchange information vital to their research work. This has been made possible by Mr. G. S. Garfitt, who wears the R.A.F. "Official Duties" flash on his shoulder and has gone to Malaya to study scientific problems connected with the development of safer flying. He has given up every moment of his spare time to produce a radio-communication system which keeps the Singapore team in constant touch with their headquarters in England, 8,000 miles away—making expert advice from Britain's entire scientific organization readily available. Problems which may have arisen during the day's work can be conveniently talked over in the small hours of the morning when conditions for radio communications are most suitable.

Air Marshal G. O. Johnson Retires

HON. COLIN GIBSON, Canadian Air Minister, has announced the retirement of Air Marshal G. O. Johnson, C.B., M.C., who returned to Canada early in August from this country, where he had served as Air Officer Commander-in-Chief of the R.C.A.F. overseas. He had held this post since early in 1945 when he succeeded Air Marshal L. S. Breadner, C.B., D.S.C.

A native of Woodstock, Ontario, Air Marshal Johnson had a distinguished



"Flight" photograph.

SEAFIRE 47: Contra-rotating Rotol airscrews, folding wings and full Naval equipment characterize this newest deck-landing development in the amazing Spitfire/Seafire series. Performance is little lower than that of the Spitfire

record in both the First and Second Great Wars. Serving as a pilot with the Royal Flying Corps, he shot down 12 enemy aircraft during the 1914-18 war, winning the Military Cross and the French Croix de Guerre. At the time of the armistice he joined No. 1 Squadron, Canadian Air Force, which was just then being formed. He returned to Canada in 1919 in charge of the Canadian war trophy aircraft which were featured at the Canadian National Exhibition, and which were later shown in cities throughout the Dominion. Appointment as commanding officer at Camp Borden under the Canadian Air Board came in 1920.

Air Marshal Johnson later became superintendent of personnel of the Air Board, and in 1923, on formation of the Department of National Defence, was chosen as assistant director. He held a similar position upon formation of the R.C.A.F., when it came into being the following year. At outbreak of the world war he was Air Officer Commanding Western Air Command, which he had been entrusted with organizing.

Shortly after outbreak of war in 1939 he was recalled to Ottawa and made member of the Air Council in charge of organization and training for the British Commonwealth Air Training Plan. He served in this rôle until early in 1940 when he became Deputy Chief of the Air Staff. In 1942 he was appointed Air Officer Commanding No. 1 Training Command with headquarters in Toronto. In 1943 he took over command of Eastern Air Command with headquarters in Halifax.

Air Marshal Johnson held this post until taking over from Air Marshal Broadner, in London, last year.

M.C.s for R.A.F. Officers

THE Military Cross has been awarded to Flt Lt. Sydney H. Dowse, R.A.F.V.R., of No. 608 Squadron, and to Flt Lt. D. I. Pike, R.A.F., of No. 113 Squadron. An Army award, the M.C. is given to eligible R.A.F. ranks for distinguished services in ground actions. Both officers were concerned in several escape attempts.

Award

THE KING has been graciously pleased to approve the following award in recognition of distinguished service:—

British Empire Medal (Military Division)

A/C.2 Peter Mace,
R.A.F.V.R.

It is learned that A/C.2 Mace assisted in running a secret radio organization at Stalag Luft 3.

Roll of Honour

Casualty Communique No. 601.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy. "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of these 206 names in this list are second entries giving later information of casualties published in earlier lists.

Royal Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION—W/O R. J. Alexander; Flt. Sgt. R.

SERVICE AVIATION

Bewsher; Flt. Lt. A. S. Boyes; F/O G. A. Dobson; Flt. Sgt. W. J. Donaldson; Flt. Lt. C. R. Goodwin; Flt. Sgt. J. H. C. Harvey; Flt. Sgt. H. H. M. Hipperson; Flt. Sgt. R. Jones; W/O R. MacKenzie; W/O L. S. Miller; F/O S. Potts; F/O R. L. Rees; F/O R. A. Watson; Act. Squ. Ldr. W. M. Whitmore, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION—Flt. Sgt. P. J. Adashead; Sgt. D. L. Agnew; Sgt. S. Alexander; Flt. Lt. R. E. Allitt; F/O W. J. Bailey; Flt. Sgt. D. H. Baker; Flt. Sgt. G. W. Bargh; Flt. Sgt. R. F. Barker; W/O T. A. Beatey; Flt. Sgt. R. C. J. Berry; W/O R. Best; W/O A. W. Blaxall; Sgt. T. B. Boyd; Flt. Sgt. P. J. F. Brockman; Sgt. D. H. Brown; Flt. Sgt. T. P. Browne; W/O S. Buchanan; L.A./C. R. S. Bury; Sgt. V. A. Butt; F/O J. C. Byrne; A/C.1 J. C. Callender; Flt. Sgt. A. Challenger; W/O A. C. Clapham; Flt. Sgt. M. L. Claydon; W/O E. D. H. Collard; Flt. Sgt. S. C. Cook; Sgt. S. J. M. Cooper; F/O E. Cotton; Flt. Lt. C. B. P. Davies; W/O N. C. Eames; F/O A. J. Ede; P/O I. A. Edwards; W/O A. E. England; W/O P. J. Fairclough; F/O E. A. Fielding; W/O W. K. Fletcher; Flt. Sgt. W. P. Foster; Flt. Lt. F. J. Fraser; F/O C. W. Gentry; Flt. Sgt. R. Gollop; Sgt. G. Green; W/O T. Grynkiewicz; Flt. Sgt. D. C. Gurr; Flt. Sgt. G. O. W. Gutersohn; Sgt. J. Hall; Sgt. C. W. Harvey; W/O R. A. Hawkins; W/O D. A. S. Hollay; Act. Flt. Lt. R. D. Houghton; W/O W. J. Hudson; Flt. Sgt. E. F. Hughes; F/O J. Hughes; Flt. Sgt. J. C. H. L. Hunter; Flt. Sgt. J. Johnson; F/O R. A. C. Johnson; Flt. Sgt. D. R. Jones; P/O H. F. Laing; F/O C. E. Leese; Sgt. J. Lennane; P/O A. H. Lightfoot; Flt. Sgt. A. S. Lormer; F/O D. G. McGreesh; Flt. Sgt. I. T. McDowall; W/O H. McIver; Flt. Sgt. J. B. McKay; F/O J. A. McKay; F/O D. McKenzie; W/O L. Maguire; Flt. Sgt. J. R. Mantle; Sgt. F. Marted; Flt. Lt. S. D. Mayhew; Sgt. J. Mercer; F/O G. A. Mookridge; Sgt. P. W. Moore; Sgt. D. L. Mould; Flt. Sgt. D. Nelson; W/O E. J. Parker; Sgt. K. R. Parkinson; Flt. Sgt. J. R. Perry; W/O R. G. Pile; Sgt. G. Poole; Flt. Lt. G. H. Proctor; F/O B. Redfern; Sgt. E. Richardson; Flt. Sgt. H. A. Richardson; Flt. Sgt. W. G. Roberts; Flt. Sgt. J. Robertson; Flt. Lt. N. Robinson; Sgt. P. J. Sands; Sgt. A. Shaw; W/O S. J. Shepherd; F/O A. R. P. Shields; Act. Squ. Ldr. L. H. Skinner; Flt. Sgt. A. W. Smelt; Flt. Sgt. J. K. Smith; Flt. Lt. F. R. Sokell; Flt. Sgt. E. Squire; Sgt. N. J. Stringfield; F/O A. E. Stuart-Cox; Flt. Lt. D. J. Sutcliffe; Flt. Sgt. V. G. Taylor; Sgt. A. A. Tearman; Flt. Sgt. W. Templeton; F/O P. M. C. Veitch; Sgt. A. N. Welch; Flt. Sgt. M. J. Whiteley; Sgt. R. S. Wilkins; Flt. Sgt. W. A. Williams; Flt. Sgt. P. C. Woods; Flt. Sgt. R. E. Woods.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE—F/O A. Sutherland; F/O T. W. Goodchild.

KILLED ON ACTIVE SERVICE—F/O J. S. Abbott; Sgt. A. R. C. Aird; W/O W. D. Anderson; F/O G. Astley; Sgt. R. L. Bell; Flt. Lt. F. R. Berry; Flt. Lt. J. D. Cantrell; P/O K. G. Chapman; Flt. Sgt. D. W. Crutchley; Flt. Sgt. G. H. Curtis; Flt. Sgt. R. Dansk; W/O W. O. Duncombe; Flt. Lt. E. G. Filmore; Flt. Sgt. S. B. Grant; Sgt. W. A. Graves; Flt. Sgt. R. L. Gray; Flt. Lt. M. G. Horton; Flt. Sgt. R. J. Hughes; Flt. Sgt. M. J. Newman; Flt. Sgt. D. F. Payne; Flt. Lt. D. W. Ray; F/O E. D. Rees; Flt. Sgt. R. M. Reeve; Flt. Lt. W. T. Rice; Flt. Sgt. G. R. H. Rowland; W/O P. S. Rowland; Flt. Sgt. R. Scrivens; Flt. Sgt. R. Stedman; Act. Squ. Ldr. R. H. Thomas; L.A./C. E. B. Turbin; Sqn. Ldr. J. Turton; W/O H. F. Watson; W/O G. A. Wells; W/O C. E. Wright; Flt. Sgt. A. J. A. York.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE—F/O E. R. Ball; Flt. Sgt. W. Bernard; Flt. Sgt. G. L. Lennox; L.A./C. W. H. Richardson; F/O G. A. Stewart; Flt. Sgt. W. Stewart; L.A./C. W. R. Taylor; W/O J. V. Willis.

WOUNDED OR INJURED ON ACTIVE SERVICE—W/O S. V. Brazier; Group. Capt. P. G. Chichester; W/O J. M. Drew; Flt. Lt. J. A. Kraemer; Flt. Lt. J. Lawson; Flt. Lt. N. E. J. Linnett; Flt. Lt. J. Wood.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE—Act. Squ. Ldr. W. M. Bonnar.

DIED ON ACTIVE SERVICE—A/C.2 R. O. Ayres; P/O P. W. E. Backhouse; Cpl. H. W. Baileam; F/O E. F. Barber; Cpl. H. Barstow; L.A./C. S. H. Beaul; Cpl. A. J. Biles; L.A./C. H. W. Bishop; A/C.1 A. J. Booth; Flt. Lt. K. D. Boyce;

Cpl. D. Briggs; Flt. Sgt. W. M. B. Brown; A/C.1 A. Brownhill; Cpl. K. Bruce; A/C.1 R. C. Burgess; L.A./C. J. Bythway; L.A./C. R. K. Carter; A/C.2 A. G. Clapson; W/O E. G. Clark; Flt. Lt. P. B. Coates; Flt. Sgt. M. R. Crisp; A/C.2 L. R. Croft; Cpl. W. H. Crowe; A/C.2 F. J. Crowther; L.A./C. P. M. Curtis; Act. Squ. Ldr. G. E. Dance; Flt. Sgt. K. J. Davies; L.A./C. L. Davies; Cpl. K. J. Day; Cpl. D. H. Ellis; L.A./C. B. Evans; L.A./C. H. Fantham; Act. Flt. Lt. F. H. E. Ford; Cpl. G. A. Gardiner; W/O J. A. Gibbs; A/C.1 K. Gregory; L.A./C. R. N. Hackforth; L.A./C. A. Hancock; Sgt. J. A. W. Hardyman; Cpl. F. Harvey; L.A./C. H. Hickson; Flt. Sgt. J. Holmes; A/C.1 N. C. Humphries; Cpl. H. Ingham; Flt. Sgt. G. Y. Irvin; Flt. Sgt. R. T. Johnson; Cpl. W. Jones; Cpl. W. J. Judd; L.A./C. S. Kellett; L.A./C. E. W. Lake; L.A./C. A. Littler; A/C.2 J. R. Longstaff; A/C.2 A. Lord; A/C.2 J. J. McKenna; Flt. Lt. G. J. M. Martin, D.F.C.; A/C.1 R. Merriman; L.A./C. J. W. C. Monk; A/C.1 F. J. Moore; A/C.1 T. J. Murphy; A/C.2 A. Nicell; A/C.2 H. J. Palmer; L.A./C. N. Palmer; A/C.2 D. J. Quinn; Flt. Lt. R. K. Ray; Cpl. O. E. Rayson; Sgt. C. H. Renyard; L.A./C. P. Robinson; A/C.1 H. I. Rosenfield; Sgt. W. Rothwell; Flt. Sgt. B. J. Scutt; L.A./C. H. S. Sharp; L.A./C. A. D. Shingleton; A/C.2 H. Sterling; Flt. Sgt. E. M. Stern; A/C.1 W. Stobbs; Sgt. F. I. Tarry; L.A./C. T. J. P. Tighe; L.A./C. W. G. Tiplady; L.A./C. A. G. Tucker; L.A./C. E. Twizell; Cpl. W. J. Wade; L.A./C. B. W. Wakelin; L.A./C. W. J. Ward; A/C.2 F. H. Weaver; A/C.2 D. Williams; L.A./C. D. Wood; L.A./C. A. Wright; Cpl. D. Young.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE—Flt. Sgt. L. Bellingham; Flt. Sgt. R. J. Snelling; Sgt. J. D. Woodage; Flt. Sgt. S. J. Woodbridge.



Badge of No. 684 Sqn.,
R.A.F. — "Invisus
Videns" (Seeing though
unseen).

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE—L.A./CW. P. M. Fennell; L.A./CW. M. E. Seymour; A/CW.2 J. Tahhan; L.A./CW. R. J. Williams.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION—Flt. Sgt. D. T. Andrew; Flt. Sgt. A. Barnes; Act. Squ. Ldr. N. L. Bourke; P/O A. F. Campbell; W/O W. J. Cooper; F/O K. R. Dumas; W/O C. L. Edwards; P/O G. A. Foster; F/O H. T. Freeman; F/O A. H. Haley; W/O E. D. Kennedy; F/O J. A. Schmidt; Flt. Sgt. J. B. Whyte; Flt. Sgt. T. J. Wixted.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION—Flt. Sgt. J. R. Baril; F/O W. S. Bradley; P/O F. J. Conway; F/O A. S. Gibson; F/O D. F. Grose; F/O K. G. Johnson; Flt. Sgt. R. J. Leonard; F/O R. L. McMillan; Flt. Lt. S. W. Morris; F/O M. A. Russell; F/O R. Talbot; Flt. Lt. L. E. Taylor; Flt. Sgt. L. E. Whalen; Sgt. C. E. Wissold.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION—Flt. Lt. A. E. F. Anderson; Sgt. H. H. Andrews; P/O J. W. Arthurs; Flt. Sgt. W. G. Bond; P/O R. M. Botting; Flt. W. C. Cameron; F/O L. P. Cloutier; P/O E. C. Corbett; Sgt. D. L. Dellis; F/O E. L. Easton; F/O R. W. Easton; F/O E. F. Elford; Sgt. G. Ewen; P/O G. Faulkner; Sgt. R. Giesbrecht; F/O R. G. Hervey; Sgt. J. K. Hooper; Flt. Lt. R. H. Hunter; W/O C. J. D. Kerswill; Sgt. J. H. Leatham; Flt. Sgt. R. MacLean; P/O L. G. MacLeod; F/O W. P. McLeod; Flt. Sgt. A. Maxwell; W/O L. A. Minson; F/O H. M. O'Reilly; P/O J. J. P. Perron; F/O W. W. Reeve; F/O A. M. Silverthorn; F/O A. F. Timmermans; Flt. Sgt. W. A. Vaudner.

DIED ON ACTIVE SERVICE—Flt. Lt. F. H. Mahn; Sgt. C. J. Noren.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION—F/O E. A. G. Cochran; F/O B. N. Jacobsen; P/O J. G. Lomax; W/O E. W. McPherson; W/O G. H. Shearer; F/O R. A. Turton.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE—Sgt. C. D. Charters.

South African Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION—2/Lt. N. T. Wilkin.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION—Lt. L. G. Potgieter.

Royal Indian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION—F/O S. Merriman.

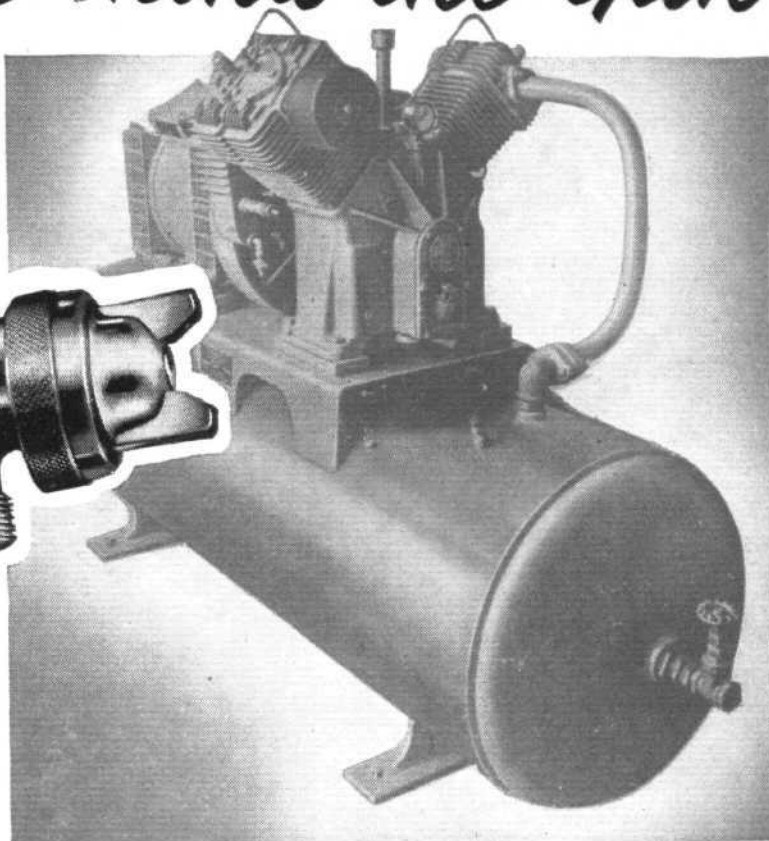
KILLED ON ACTIVE SERVICE—F/O D. S. Bamjee.



Badge of No. 683 Sqn.,
R.A.F. — "Nihil Nos
Latet" (Nothing es-
capes our notice).

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