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Colin Hinson

In the village of Blunham, Bedfordshire, UK.

War in the air

This series of magazines was published in the years 1935 to 1936. There was only one fully coloured page (in Part 2) however some of the pages were monotone colour - the covers for instance were always a shade of blue, and some full page photos were sepia. All these monotone pages are presented here in grey scale to reduce the file size. There are around 2,000 photographs and the text is searchable with around 99.5% accuracy.

There were a total of 25 parts which are available from Blunham.com/Radar as parts 1-10, 11-20 and 21-25.

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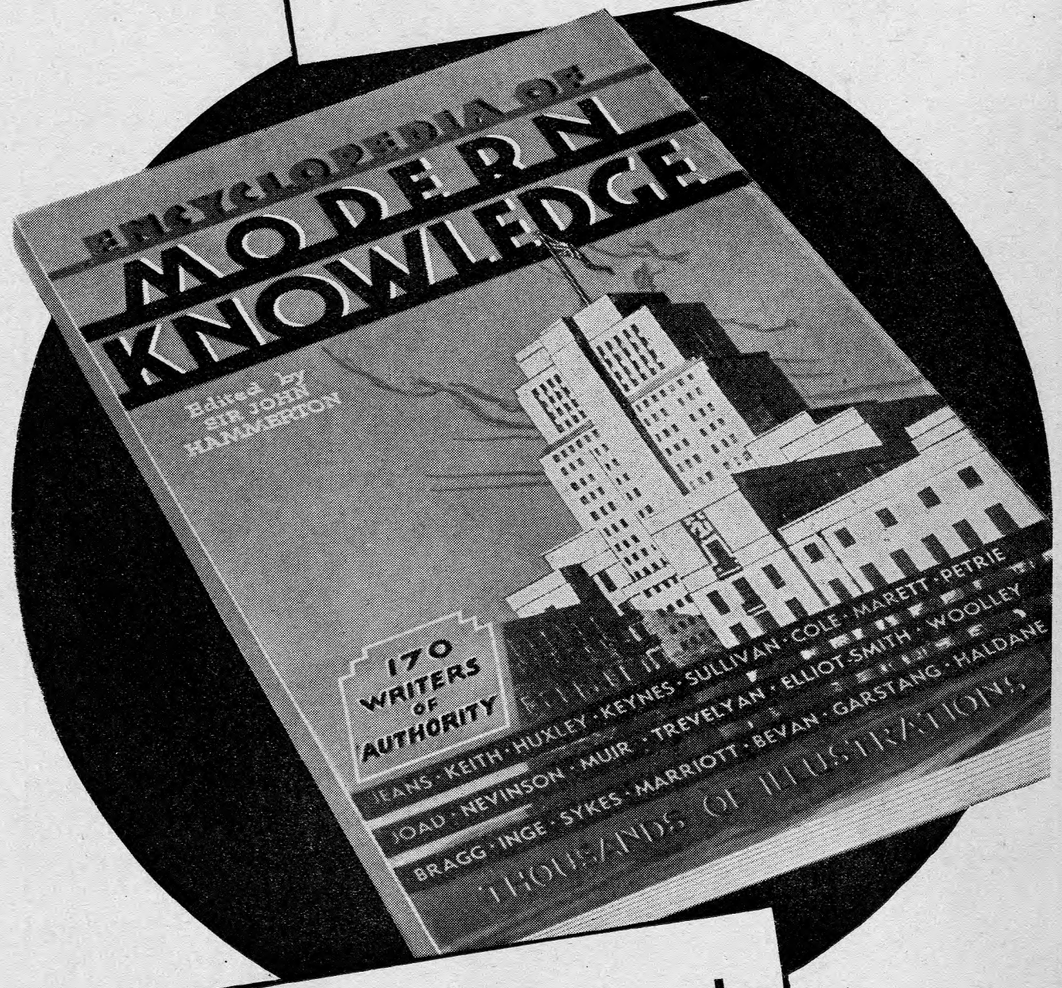

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Part 21 Complete in 25 Weekly Parts SEVENPENCE

WAR in the AIR

AERIAL WONDERS OF OUR TIME

SIR JOHN HAMMERTON
Editor



Editorial Eddies

John Carpenter House, London, E.C.4.

FOR two or three weeks past I have said little or nothing about the contents of forthcoming Parts of WAR IN THE AIR, so I may be permitted, perhaps, to take the synopsis of Part 22 as the subject of these notes. It opens with the continuation of Mr. Robert Brenard's chapter called "Luxury Liners of the Air," which he concludes by drawing attention to one of the ways in which the air lines are rivalling the railways. The second chapter is in Captain J. B. Sterndale Bennett's series "War in the Air." Calling it "The Cauldron of the Heavens," he describes the share taken by the Royal Flying Corps in supporting the harassed and retreating British infantry during the great German attacks of March and April, 1918. He mentions, too, the bombing raids on German industrial centres by the Independent Force.

FOLLOWING this is a chapter which has been written for us by Lieutenant-Colonel J. T. C. Moore-Brabazon, M.P., one of the pioneers of aviation. In it he deals with the relative qualities of the military and the commercial machine. Early in the chapter he rather questions an opinion which is very widely held, namely that the Great War helped aviation by virtue of the enormous progress on the scientific and production side. His own words are: "Yet, on reflection, I very much doubt whether, on the commercial side, it did the whole movement any good." The reason appears to be that the requirements of the military were so different from those of the commercial lines. Moreover, in time of war, expense is no object, whereas commercial aviation has to take into consideration all the time and every time cost of production and fuel and low rate of upkeep. However, I can best help my readers to form an opinion on this matter by referring them to the suggestive and informative chapter itself.

THE next chapter is in the series "World's Wonder Planes," and in it Major Turner gives a description of what is probably, at the moment, the most popular of all small machines, the one called the Flying Flea. It is of French origin and only costs about 2d. a mile to fly. In fact, its cost throughout is exceedingly small, as is that of another light machine known as the Drone, which has been adopted and developed by its makers, the B.A.C. Ltd. Major Turner tells us that the owner of one of these light aeroplanes flew 216 miles from London to Rotterdam at a cost for petrol of 5s., and another aviator crossed the English Channel on a Flea he had made himself at a cost of only 1s. 3d. Somewhat more expensive than the Flea is a Czechoslovakian machine now being made in England under licence and known as the Praga Baby.

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Order Part 22 of WAR IN THE AIR Today—Out on Thursday, April 2

The Airman's View. 7

THE WORK OF THE AERIAL CAMERA

By Charles E. Brown

Our ranks have been reinforced by another expert, who tells us how photographs are taken in the air, both for civil and military purposes. This branch of photography has only come into its own during the last few years, during which Mr. Brown, as his photographs reproduced in many pages of this work show, has kept well abreast of its latest developments

"GO up and take a photograph of ——" To many men to whom a few years ago this order would have brought a thrill, a feeling of being assigned a task of out-of-the-ordinary importance, it is now merely a routine instruction.

In civil life aerial photography may be divided broadly into two categories—press and commercial. The commercial purposes are concerned largely with advertising: the manufacturer requires views of his works; the hôtelier wants to show in his latest booklet how his hotel is surrounded by gardens, its proximity to the seashore or how just a short road leads guests to the golf course. The engineer often keeps a photographic record of the progress of a constructional work, and the borough surveyor a record of the growth of the town's new housing scheme. The photographer of such subjects usually has the advantage of choosing his day—one when the weather is favourable.

Weather is the paramount factor in the work. Since the World War great strides have been made in the manufacture of photographic plates and films; they are faster and sensitive to a longer range of colours; lenses also are faster. Filters may be used to eliminate some of the mist, but not all of it. But, despite all these modern aids, perfection can only be achieved when the atmosphere is clear and the sun shining.

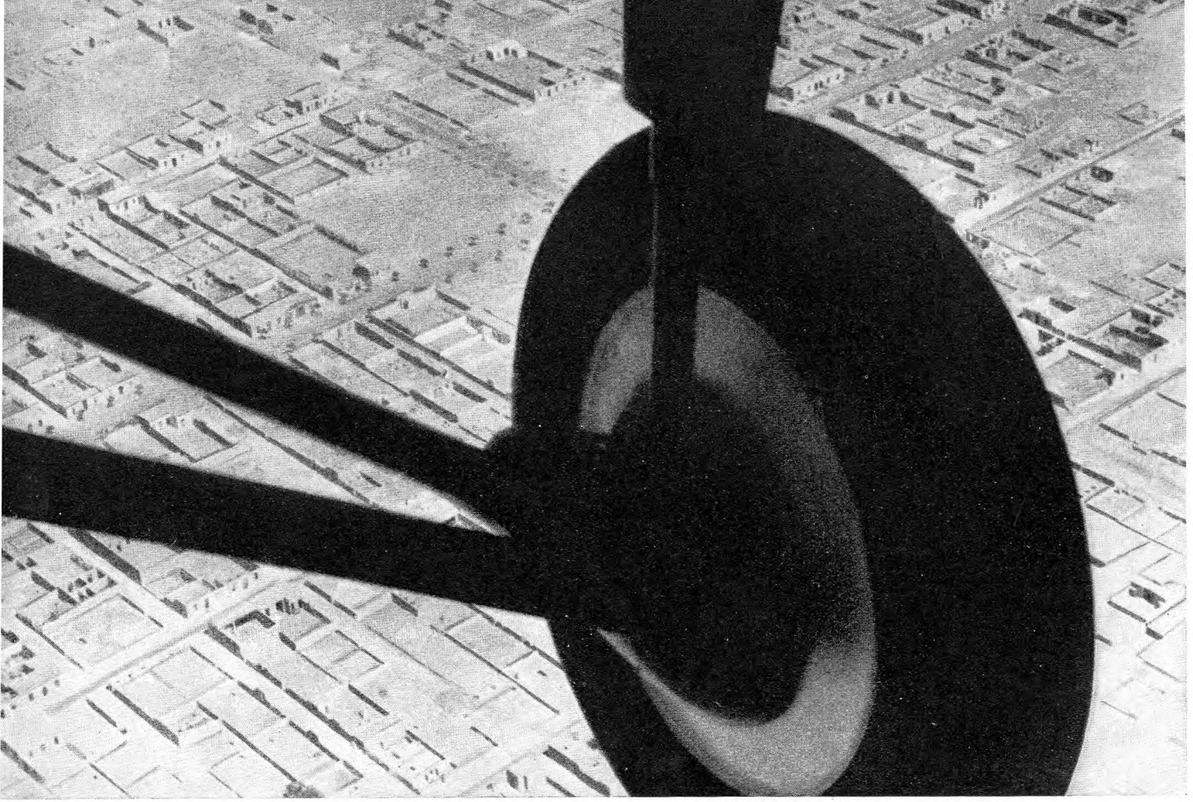
The flying pressman has not the advantage of choosing his weather. When news "breaks" he flies—and makes the most of it. There is a fire at the sawmills near the docks, a liner aground off the coast of Cornwall, or a big railway smash. He is speeding by car to the nearest aerodrome while the pilot is warming up the engine of the aircraft. There have been cases where the risks run in the gathering of news

FIRST GLIMPSE OF FRANCE

Air liners on the regular route between London and Paris often pass over the popular resort of Le Touquet, on the French coast. This photograph of the sea-front, taken from an Imperial Airways machine, makes the holiday-makers gathered on the sun-baked sands below resemble mere ants

Charles E. Brown





Erwin Berghaus

WHEELS OVER EGYPT

Only in the air can the traveller get a true and undistorted idea of the lay-out of a stretch of land. Particularly is this true of towns, although it is comparatively difficult to pick out any landmark. In the above photograph, for instance, taken near Cairo, the design is monotonous yet of peculiar linear symmetry

photographs have been too great to be justified, and disaster has resulted, but we are not at the moment concerned with the ethics of the job. Do it and argue afterwards is the rule.

But it is not only of disasters that the aerial view is useful. It often provides the best impression of historic ceremonies—the launching of a big ship, for example. The unveiling of many of the war memorials in France and Belgium were illustrated in this way. The use for this purpose is, however, limited in the case of ceremonies taking place in towns or cities, owing to the restrictions on low flying.

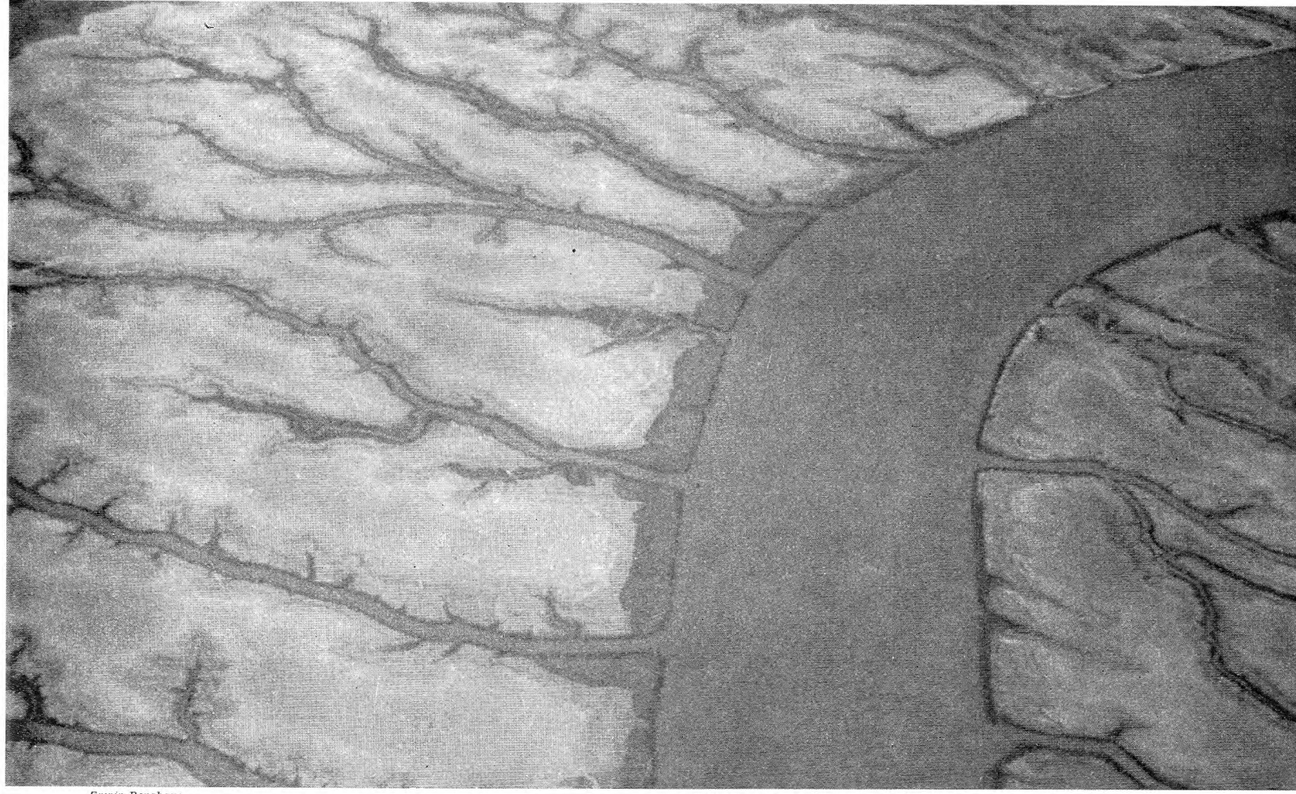
Aerial photography is team-work. The closest possible co-operation between the photographer and his pilot is essential. It is an advantage if the two can constantly work together, each getting to know the other's methods. If the object to be taken is stationary we shall probably fly several circles round it, selecting the angles and height from which to work. Finally, as each shot is approached, we fly a little higher than the level from which the photograph will be taken. The pilot is warned; he throttles back the engine to minimize forward speed and vibration, and in doing so sinks to the required altitude. Having got into this position, it may be necessary to turn the machine slightly to port or starboard in order to clear wing-tips from the line of vision. When photographing objects moving on the surface, such as ships at sea, the procedure is much the same, except that allowance has to be made for the constantly changing position of the objective.

To the writer, the most exciting branch of aerial photography is that of taking aircraft in flight. Flying alongside a new aeroplane during trials is always fascinating—seeing its characteristic points, spotting its angles and comparing its speed with that of one's own and other aircraft. Here, as in no other branch of the work, is one free from weather conditions except for gales or dense fog.

Air pictures are no longer a novelty; they no longer justify themselves simply because they are taken in the sky, any more than a snapshot somewhere on Epsom Downs would faithfully illustrate the race for the Derby. Composition and backgrounds must be studied and must be pictorially right. If it be a land machine, a suitable land background would be chosen. Supposing it had been given the type name of Salisbury, one would endeavour to include the cathedral with its famous spire. If a seaplane or a flying boat, coastal scenery would be selected, or even open sea.

It is, however, not infrequently the case that visibility is poor and the surface screened by dark, grey clouds. It is then that we use the silver lining for our background. A visit to the blue sky above is an ever-welcome excursion, and I know many airmen, with countless flying hours to their credit, who still get a thrill from the celestial panorama of blue and dazzling white, with its clean, crisp air, which greets them on emerging from the moisture-saturated shroud that keeps the sun's rays from the city below.

Those silly little people down in London! Why don't they come up and enjoy the fresh air? An enormous sense of superiority claims one up here. You know that feeling out tramping at crack of dawn on a spring morning when all others are sleeping? It is that amplified. You are on top of the world. And what material there is for



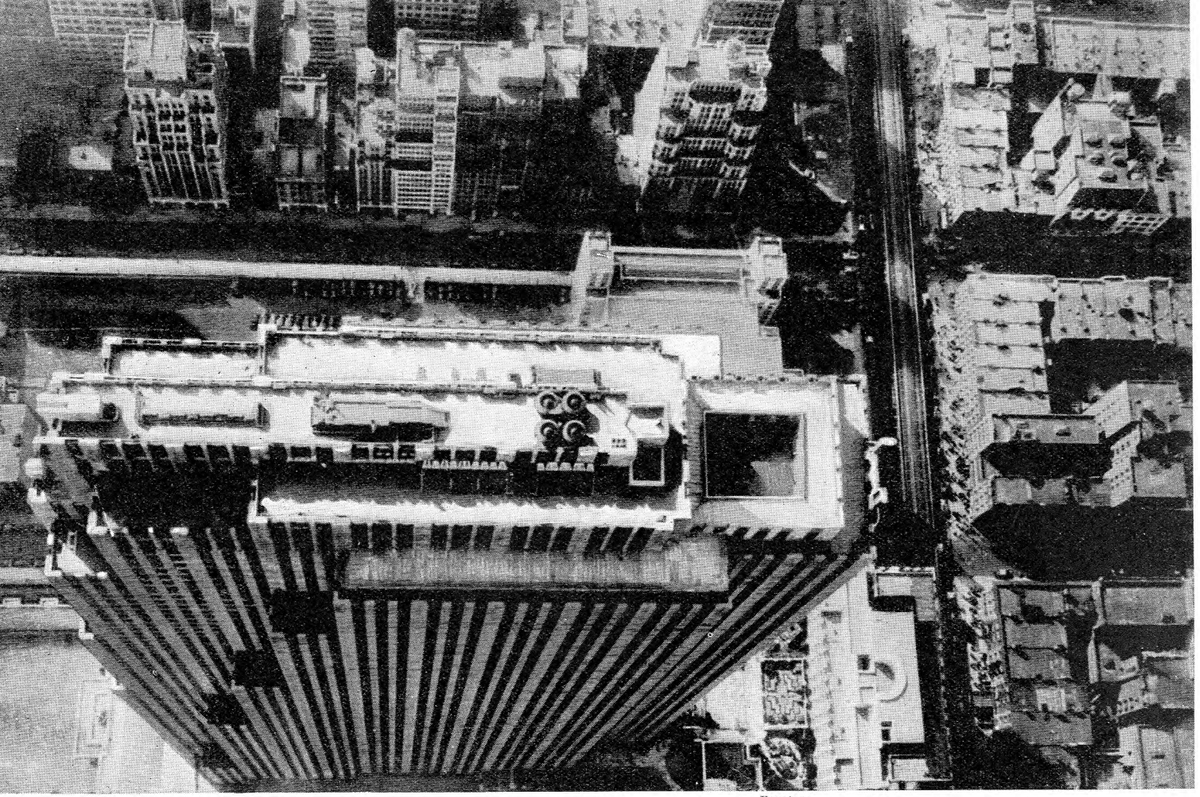
Erwin Berghaus

RIVER AND RAVINE IN AERIAL PANORAMA

Flying along the main Empire route linking Australia and India to the Mother Country, the passenger obtains a kaleidoscopic view of the terrain which is rich in contrasts. Above, for example, is the flat, broad expanse of the Shat el Arab, formed by the confluence of the Euphrates and Tigris. The river and its numerous tributaries resemble the trunk and branches of a tree. Only about 600 miles away is the Wadi Yarmak (below), a deep-cut valley at the foot of the rugged mountain slopes of the Holy Land

American Colony





Keystone

PERSPECTIVE RUN RIOT

This unusual example of the aerial cameraman's art was taken almost immediately above the great 70-storey R.C.A. building—840 feet high and the hub of Radio City, built in the heart of New York. The austere, yet strikingly beautiful, modern architecture typified in this sky-scraper seems more forbidding from this aspect than from the ground

backgrounds: billowing masses, dips and hollows, here and there a hole where Mother Earth is just visible. There are forms and shapes innumerable against which to place the target, which may be a single plane, a flight or a squadron; also, there is a vast range of lighting effects. We may be taking "down sun," with all its vivid brightness, or taking silhouettes on the shadow side against varying shades of grey.

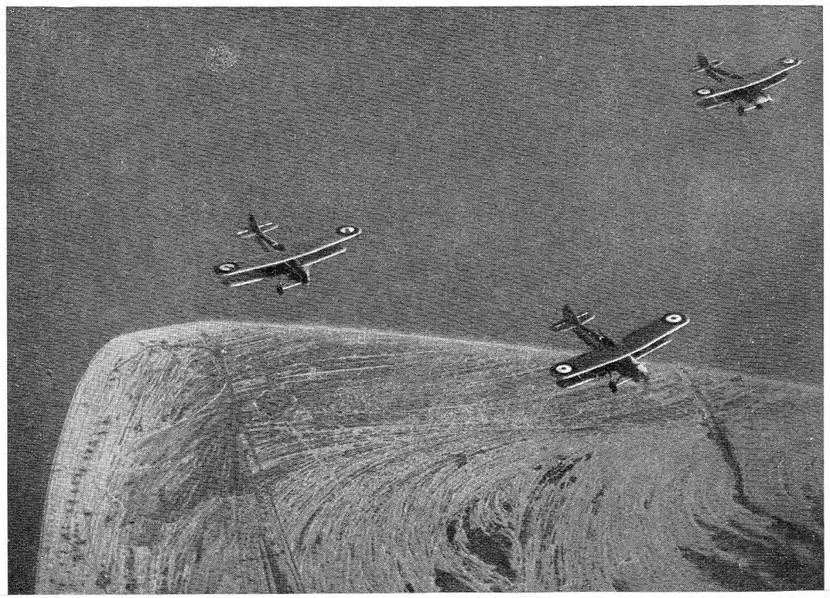
The accessibility of these regions varies greatly with the machines in use at the time. Quite recently the officer commanding a squadron of Royal Air Force fighters remarked, on finding conditions bad near the ground: "We will pop up and take the photographs above the clouds; we ought to find nice weather at twelve thousand." And we did. A few minutes' flying, that is all. To a small civil machine with a lower rate of climb this would be a task of some magnitude. I remember going up from Croydon to take a new, small passenger liner, and was being flown myself in an old aircraft. It took so long to gain the necessary height that by the time the photographs were taken we were over the coast.

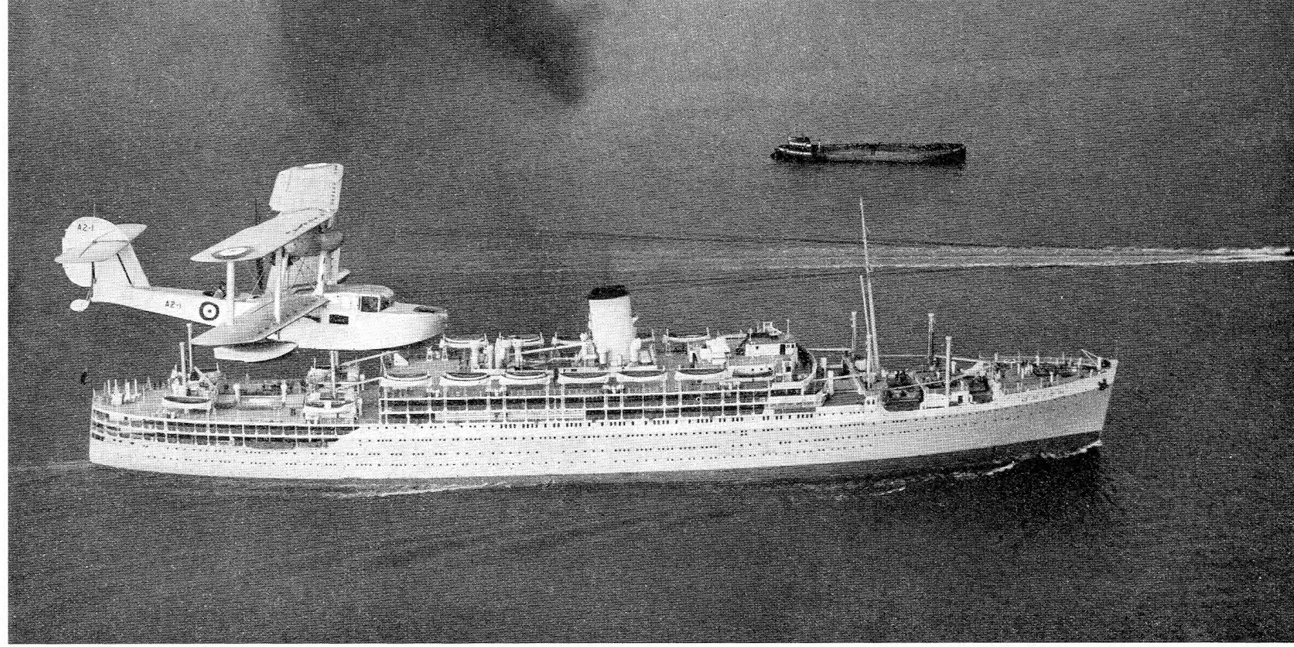
The actual photography is very little different from that on the ground, and can be done with standard apparatus, so long as the camera has a sufficiently high shutter speed. My own is an

BY WIND AND RAIN

The crews of these Hawker "Harts," intent upon bombing London unscathed in a mock air war, have probably no time to study the extraordinary storm-swept pattern of Dungeness beach as it is presented to the low-flying airman

Charles E. Brown





Photos: Charles E. Brown

PROUD SHIPS AND A FLYING ESCORT

Few will deny the dignity of a great liner, and although an aerial viewpoint may dwarf her size, an added beauty of line is achieved thereby. In this page we illustrate two new liners, the paint on their hulls still glistening. Above is the Orient liner S.S. "Orion," escorted by a Supermarine "Seagull" amphibian (see also page 323), destined for Australia. An important rôle of the R.A.F. flying boat in time of war would be to protect merchant shipping. Below, the great French liner "Normandie," lying in Cowes Roads





G.P.A.

GRANDSTAND FOR BIG GAME

To see a huge herd of wild animals stampeding from the noise and shadow—not to mention the unwelcome appearance—of an approaching aeroplane is one of the greatest thrills of a flight over the wilds of Africa. The above photograph, taken by Sir Alan Cobham during his survey flight in 1931, shows a herd of elephants charging through a swamp in the southern part of the Sudan

ordinary hand camera bought before the War, but recently modified by conversion into a box camera by replacing the bellows with wood. This became increasingly necessary as the speed of aircraft increased, as, when the camera with leather bellows is held over the side of the fuselage, the slip-stream is almost sure to blow them in.

The communication between pilot and photographer in the air is mostly done through the voice pipe, but last-minute instructions are often more conveniently conveyed by hand signals, as they usually prove quicker. For this reason large flying boats are ideal, as there is generally a seat in front of the pilot and the passing of signs is rendered extremely simple. There are, of course, other factors which make some aircraft much better photographic machines than others. I prefer the type in which one remains standing in the cockpit, rather than seated. This applies particularly to service machines, where the safety regulations are indeed rigid.

As a case in point, I flew in a light bomber during last year's Air Defence exercises. As we had to go to a great height, an oxygen mask had to be worn in addition to heavy overalls. We were going over the sea, so a pneumatic flotation waistcoat was insisted upon, and I had also the regulation parachute. It will be seen that with all these encumbrances one's movement is so restricted that from a sitting position it would be extremely difficult to manipulate the camera successfully. When we were very high up I inadvertently disconnected my telephone, and my pilot was unable to tell me to start using oxygen—an instruction I was waiting for, and thinking I was going to "pass out" meanwhile. Sometimes it is the pilot who is having the trying time, particularly when flying low. The photographer, in his anxiety to get a close shot, is oblivious of dangers of which the pilot, eager to help, is vividly conscious.

There are other purposes for which photography is employed in the Royal Air Force. The bursts during bombing practice give an exact record of the accuracy or otherwise of the aiming. In the Fleet Air Arm the fall of shot from ships is similarly recorded. Then there is the ingenious "camera-gun," looking very like a machine-gun, used for aerial target practice. The gunner cannot fire bullets at another aeroplane, so each pressing of the trigger takes a photograph, and the film, when developed, records the number of "hits."

Lastly, there is vertical photography, where the camera is pointing exactly vertically at the ground (as explained in the chapter on Mapping). This is used for survey work and, in time of war, for taking enemy territory, to study his lines of trenches, gun emplacements, etc. These photographs are so highly technical that they are often unintelligible to the lay observer. They are certainly uninteresting pictorially, as the sense of contour is destroyed.

FRENCH AIR ACES AND THEIR VICTORIES

By Capt. J. B. Sterndale Bennett, M.C.

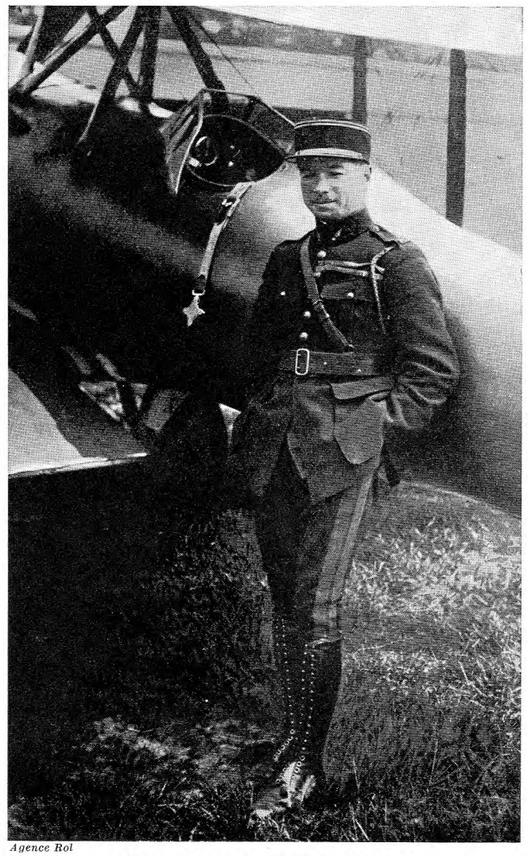
Every country produced its crop of outstanding pilots who became notable for their deeds of daring and the number of their victims. France was particularly favoured in the number of her skilful and heroic airmen, some of whose exploits and adventures are here related as are those of one Belgian and two Americans

The science of aviation was at a higher stage of development in France than in Great Britain when war broke out in 1914. This was true both in the number of experienced pilots who were available for their air force, and the facilities at hand for the construction of aircraft. Indeed, the British Flying Corps owed much in the early days to French factories for the supply of necessary material.

Of the French pilots, two outstanding figures immediately emerge, airmen of great experience and superb daring—Adolphe Pégoud and Roland Garros. Both were pioneers of aviation in France, and as early as 1912 Garros had set up a record by flying at 1,500 feet. Both threw themselves into the fight with enormous enthusiasm, and both eventually lost their lives in the service of their country.

Garros was probably the more subtle fighter, and it will be remembered always that he was the first to devise a method by which he could fire through the arc of his propeller blades. His contrivance was a simple one, consisting of pieces of metal attached to the blades to deflect the bullets if they did not make a straight clearance. He was brought down behind the enemy lines, and the discovery by the Germans of his method led to the invention, by Anthony Fokker, of the first true interrupter gear, which for a time proved so disastrous to the airmen of the Allied forces.

Garros lived to fight again. Every aid which ingenuity could devise was given to him from his home country to enable him to escape from his German prison. This he succeeded in doing, but only to lose his life in aerial combat in the later days of the War. Of him, at least, it can be said that, by his skilful control of whatever machine he was flying, and by his ready acceptance of every risk in the interests of experiment, he added greatly to the knowledge and confidence of his contemporaries.



Agence Rol

FRENCH 'ACE OF ACES'

Captain Paul René Fonck (above), who entered the French air service in the early days of the War, flew continuously to the end, and is still flying. During the War years he shot down 75 enemy aircraft, and never received a wound. Commander of the Legion of Honour, he was mentioned in dispatches on twenty-eight occasions

One of the great names in French aerial history is that of René Fonck. Attached, in September, 1914, to the 11th regiment of Sappers, in April, 1915, he took his pilot's certificate, served in a reconnaissance and photographic squadron and had already been awarded the Médaille Militaire when, in the spring of 1917, he was transferred to the famous Escadrille S.P.A. 103, to become one of the most deadly of the French scout pilots. Fonck was essentially the duellist, prepared to take on any equal or unequal combat that offered itself.

One of the most remarkable of his attributes as a marksman was the extraordinary economy with which he used his ammunition. On one occasion in May, 1918, he accounted for three enemy aeroplanes with an expenditure of twenty-six bullets, and on another, later in the year, in September, he brought down six German opponents in two hours and spent only fifty-six bullets in the effort. The feat of bringing down six enemy machines in so short a space of time had only been equalled twice before—by Captain Trollope and Captain Woolett of the Royal Flying Corps. Fonck was a great tactician who never sought the enemy's fire, and, despite his great record of seventy-five official victories, was never himself wounded.

Very different were his compatriots Georges Guynemer and Charles Nungesser. Guynemer, like his British contemporary Mick Mannock, had some difficulty in passing the medical tests for the French flying corps, and yet during his meteoric career he was shot down eight times and was several times



Topical

READY FOR THE AERIAL ARENA

Lieutenant Nungesser (see also below) was a man to whom inactivity was entirely abhorrent. This photograph that was taken on the Somme in September, 1916, shows the great pilot standing (extreme right) with a group of fellow-officers beside his Nieuport Scout before making a flight over the German lines



wounded. With Fonck he served in the famous Escadrille des Cigognes, or Stork Squadron, to which so many of the great French air aces belonged. His record was fifty-three enemy victims. Until he finally disappeared—he literally disappeared, for no trace was ever found either of his body or his aeroplane—he had more narrow escapes than any living airman. A description of one of them is well worth quotation from Mr. W. E. Johns' notable book "Fighting Planes and Aces."

He accepted combat with a large formation of enemy planes from over the lines.



Agence Rol

FRANCE'S HAPPY WARRIOR

Lieutenant Charles Nungesser, third on the list of French fighting pilots with 45 victories, is seen on the left, and in the centre above, wearing his many decorations. Unlike Fonck (see page 651), Nungesser had an amazing succession of injuries, but insisted on remaining in service as an honoured "free-lance" pilot. He disappeared on an attempted Atlantic flight, in company with François Coli, in 1927

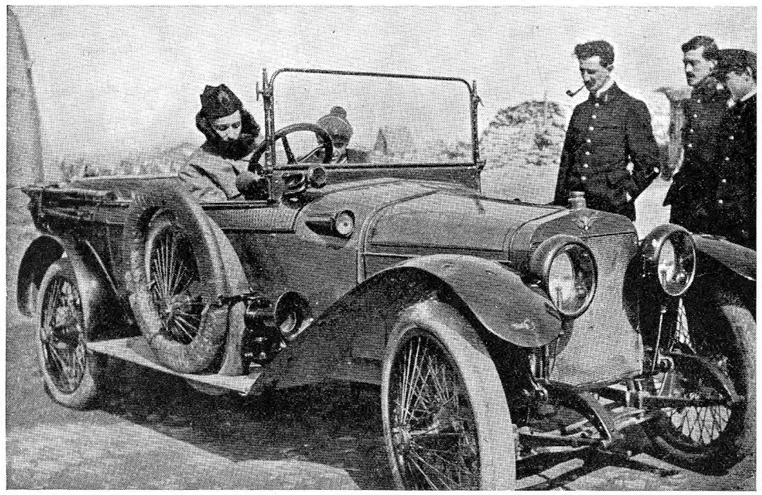




Agence Rol

A NATIONAL HERO

Guynemer (see also page 659) has become a name of almost legendary significance to the French nation. On the left we see him inspecting a Lewis gun drum; he is wearing the Cross of the Legion of Honour. Above, just before one of his last flights. The machine is a Spad, similar to his famous "Vieux Charles"



GUYNEMER OFF DUTY

This informal photograph of the great pilot shows him in his car—a mere plaything for one accustomed to, and apparently revelling in, the give and take of mortal air combat. To his outstanding aptitude as a pilot, Guynemer added considerable technical skill. He designed a shell-firing gun for his own aeroplane

His engine was put out of action and he began to glide down towards the trenches. Unable to manoeuvre, he ran the gauntlet of machine-gun fire from the hostile aircraft. Lower and lower he dropped until he was gliding over the enemy support trenches in a sea of fire and hurtling metal. Every gun was turned on him, and the infantry poured a murderous rifle fire at him. But the French infantry had seen the tattered and torn Cigogne coming, and as Guynemer crashed in a shell-hole in No Man's Land, they poured blindly over the parapets regardless of the enemy's fire and carried the ace to safety.

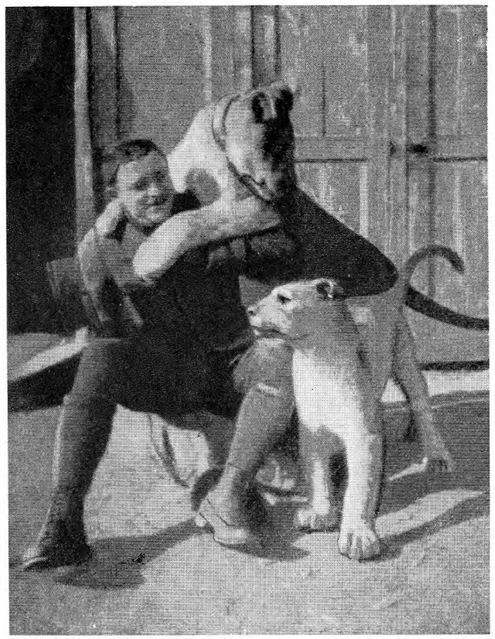
On another occasion he fell to the ground from 10,000 feet in a shattered machine and escaped unhurt. His end came in September, 1917, when he is believed to have crashed near Poelcapelle, but, as has been said, mystery still surrounds the manner of his death.

Charles Nungesser, another outstanding French pilot, has been described as "a born fighter—with the eyes of a Norseman and the fire-eating 'guts' of the southerner." He was a cavalryman when war broke out and immediately distinguished himself by capturing a number of German staff



MEMBER OF THE 'STORKS'

Adjudant René Dorme, affectionately known as " Père " Dorme, was another member of the famous Cigognes (or " Storks ") Squadron. His influence and popularity were exceptional, and when the news of his loss came through on May 25, 1917, Guynemer wrote: " The disappearance of Dorme is certainly the greatest loss suffered by French aviation." At the time of his death, Dorme was officially accredited with 23 victories

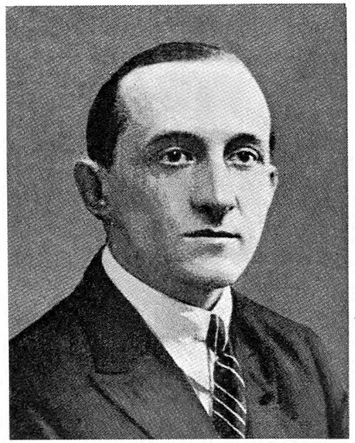


PLAYING WITH LIONS

Fear had no place in the vocabulary of Captain Raoul Lufbery, an American of French extraction, as may be seen from this photograph of the ace with two lion-cub pets. After service in the Escadrille Lafayette, he joined the American 94th Squadron and scored 17 victories. When his own machine was shot down, Lufbery jumped to his death

officers in their car, for which he received the Médaille Militaire. On his transfer to the flying service, he made his mark at once and, despite constant and serious wounds (he was hit seventeen times), continued to be a menace to the Germans until the Armistice.

A story is told of how on one occasion he broke out of hospital with his foot in plaster of Paris and returned to his squadron because he had heard that René Fonck, his greatest rival, had reached his own total of official victories. Over and over again he could have retired, and, indeed, was pressed to do so, but he remained on service, a maimed man and a lone pilot, who took the air as and when he pleased. He ended third on the list of French airmen, with 45 victims. Nungesser, it will be recalled,



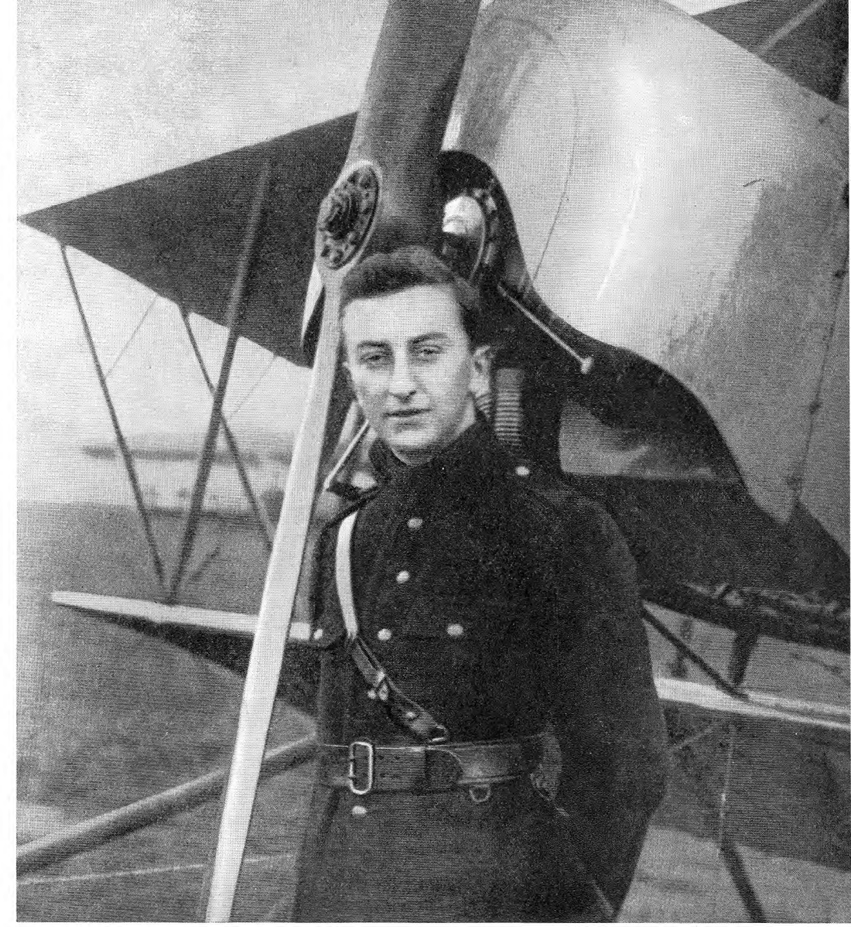
FRANCE'S FOURTH

In spite of many unconfirmed claims, and also of a long period of internment, Lieutenant Georges Madon stands fourth on the list of French fighting pilots, with 41 victims. His adventures were hair-raising and his escapes legion, but he survived the War by a few years

attempted an Atlantic flight in May, 1927, with another distinguished French pilot, François Coli, and was never heard of again.

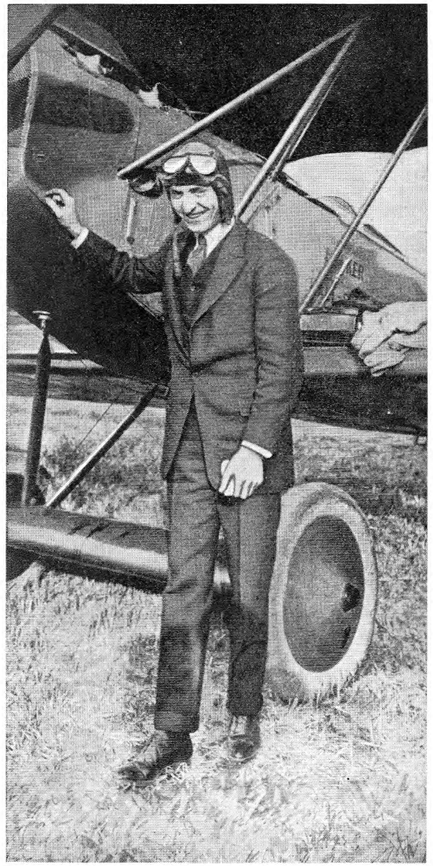
Two other French pilots stand out in the front rank of their fellows, Georges Madon and René Dorme. Madon was already in the French flying corps at the outbreak of war, a highly skilful and daring pilot. His war career, however, was delayed by an unfortunate crash in Switzerland. He was interned, escaped, and, on his return to France, both he and his observer were given a term of imprisonment. But when he did reach the front again he proved his worth, and Germans who ventured to challenge him found this brilliant marksman a deadly enemy. His method was one of point-blank attack. He seems to have cared little whether he collided or not, and, indeed, did so on one occasion, crashing to earth and escaping serious injury in the most miraculous manner. He is officially credited with forty-one victories, though, as he often fought single-handed beyond the eyes of witnesses far behind the German line, there seems little doubt that this is an underestimate.

René Dorme, too, was a brilliant fighter who had been in the army before the War and transferred to the flying corps in 1915. He was posted to the famous Cigognes squadron, and victims soon began to fall rapidly to his gun. Although a determined attacker, he had an almost uncanny knack of avoiding the bullets of his enemy, until



STARS WITHOUT STRIPES

Major Edward V. Rickenbacker, seen below with a German Fokker after the War, came to Europe as General Pershing's chauffeur, but transferred to the flying corps and became America's leading ace with 25 victories. He is now a commercial air-line pilot



FROM ACE TO ATTACHÉ

The distinguished career of Major Chevalier Willy Coppens de Houthulst, D.S.O., M.C., began in the Belgian flying service in 1915, but his fame rests on his balloon-strafing, which was quite unequalled. Altogether he shot down no fewer than 26 balloons and eight aeroplanes. Today Coppens is Belgian Air Attaché in London

at last, on May 25, 1917, he was shot down, his score being at this time twenty-three aeroplanes. Others had had greater successes, but Dorme was universally acknowledged as one of the finest duellists in the air that France had produced.

No account of the intrepid airmen of the Allied forces operating on the Western front could be complete without some reference to that distinguished Belgian, Willy Coppens. The son of an artist resident in Brussels, he joined the army in a Grenadier regiment, and it was not till late in 1915 that he graduated as a pilot. He at once showed himself possessed of considerable courage and skill and ready to seek battle wherever it presented itself. One of his special delights was bringing down German observation balloons—an often highly dangerous operation, for they were heavily protected from the ground.

The destruction of enemy observation balloons was never allowed to count in the sum total of victims claimed by British airmen. Twenty-six of Coppens' " victories " were over enemy balloons, and it is difficult to see why this form of attack should be regarded as less hazardous than a straight air fight. He claimed altogether about forty successes and received every honour that his country could bestow.

Fighting with the French from early days was the famous American Lafayette Squadron, but it was left to the later days of the War to produce the most outstanding American aces, of whom Edward Rickenbacker and Raoul Lufbery were most noteworthy. Rickenbacker, a cautious but confident pilot, claimed twenty-five victories, Lufbery seventeen. The latter was killed in combat in May, 1918, leaping to death when his machine crashed in flames.



Associated Press

CO-OPERATION FROM THE CLOUDS

The camera has caught the sunlight as it glints on the metal airscrew blades of these U.S. navy fighters in such a way as to make them appear motionless. Were one present at Washington when the photograph was taken, however, the drone of the powerful engines as the aircraft sped overhead would soon dispel this illusion

Aerial Armadas in Being. 8

AIR POWER OF THE U.S.A.

By Major Oliver Stewart, M.C., A.F.C.

From this chapter the reader will gain a good idea of the progress being made in the United States in developing both civil and military aircraft. In this matter, as in others, the American nation is making very good use of its almost boundless possibilities, and is becoming air-minded to an extent that surprises visitors from the Old World

THE United States maintains the two-service system upon which the British Royal Air Force was originally founded. The country has an army air corps and a naval service, and the method, although it has been severely criticized from time to time in America, has given good results. There has recently been added, within the body of the two services, an air force general headquarters. The commander at air force headquarters is responsible direct to the chief of the army general staff.

When attempts are made to estimate the relative air strengths of the leading air powers, the United States is invariably placed near the top of the list, and probably, if a just conclusion could be arrived at, it has now moved into first position and so displaced France. I put forward this possibility, not because the first line strength of the United States air services has yet reached as high a figure as that of the French, but because commercial aviation has made such enormous strides in the United States that the country now possesses the biggest and best equipped aircraft industry in the world, not even excluding the British.

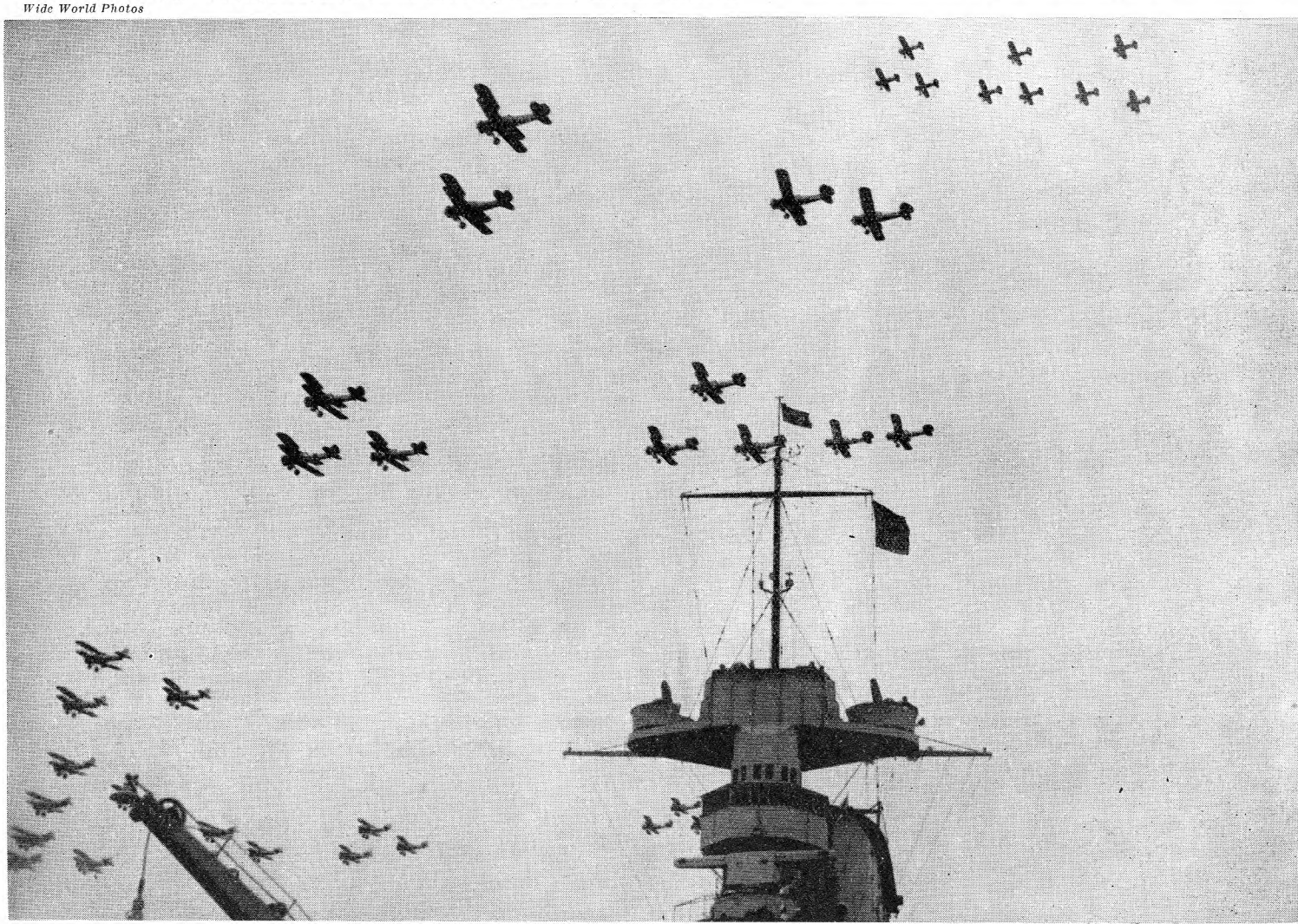
Moreover, it is indisputable that the technical knowledge that has been amassed by the Americans in the course of their work upon the development of commercial aeroplanes has enabled them to produce a number of military types which possess outstanding performance. The Boeing bomber may be mentioned in particular. The prototype crashed recently with the loss of all those on board, but it was established by the American accident inspector that the cause of the crash had nothing to do with the airworthiness of the machine ; it was the outcome of the pilot going up with the controls locked and not discovering what the trouble was until too late.

The Boeing bomber, as its lines testify, is a development of the Boeing transport, one of the fast American commercial machines. The Douglas firm have also produced bombers which may be regarded as developments from their commercial types. It is reported

U.S. NAVY'S VITAL NEW ARM

There are few more thrilling sights at sea than a great navy escorted by its fleet of aircraft. In accordance with the present building programme the U.S. Naval air arm will have, by 1940, no fewer than 1,910 machines. Above are fighters from the U.S. carriers "Lexington" and "Saratoga" flying over the latter vessel during combined exercises

Wide World Photos





Keystone

TUNED TO FIGHTING PITCH

The U.S. aircraft carrier "Saratoga" (also illustrated in page 326) was, like its sister-ship "Lexington" and several of the British carriers, originally designed as a battle-cruiser, and is one of the most powerful warships afloat. Above, her huge complement of Vought "Corsair" two-seaters warming up on the flight deck

that the Martin flying boat, which made the first Pacific schedule mail flight towards the end of 1935, is to form the basis of a fleet of military flying boats.

All these machines enjoy exceptionally good performance, and the fullest credit must be given to the American air services for being the first to appreciate the value of introducing such components as the closed pilot's cockpit in military machines, the retractile undercarriage, the wing flap for slow landing and the controllable-pitch airscrew These components were first brought to the practical stage in the American commercial types in the efforts to increase their speeds without diminishing their useful loads, and they were afterwards found to be of value also to military types.

The British Air Ministry freely acknowledged the advances made by the United States on two occasions, the first of them an historic one. This was when Fairey Fox day bombing aeroplanes, fitted with Curtiss twelve-cylinder American engines, were ordered for the British air force. An outcry was raised, but the order was shown to be a wise one, for it shed new light upon the speed possibilities of military types, and did much to destroy the tendency to cripple a machine's performance by loading it up with numerous superfluous articles of military equipment.

Before the Fairey Fox came to the Royal Air Force with its American engine, the British service was mainly equipped with types of aeroplanes which were aerodynamically inefficient because of the large number of extraneous fittings that were hung about them, and because but little interest was shown by the authorities in streamlining. The American air services, therefore, must be given the credit for the Royal Air Force's first fillip in speed development.

They gave it another fillip more recently when they showed that some of their commercial machines were capable of speeds actually higher than those of the fastest fighters in the British service. And then, again, they directed the attention of the Air Ministry to speed when they announced the 200 m.p.h. day bomber and, later, the 200 m.p.h. heavy bomber. The Air Ministry decided to buy an American military aeroplane for experimental purposes, and it purchased the Northrop day bomber and sent it to Farnborough, so that the technologists there could try to find out where the speed came from and study thoroughly the machine's aerodynamic qualities.

In "attack ships"—specially designed for ground strafing and low bombing—speeds have gone up very rapidly, and so they have in the heavy bombers. In both these classes of machine the American air services must be credited with having made notable progress. Whether they are ahead of all other countries it is difficult to say. They have excellent machines; but whether these machines are yet widely dispersed among the squadrons, or are still only in use in one or two squadrons, has not been stated.

In the fighters, as they are called in Britain, or pursuit ships as they are called in America, the American services are almost certainly behind the British. The American fighters do not seem to have progressed with anything approaching the rate of their bombers; this is another indication of the degree to which development has been influenced by commercial activities. The pursuit aeroplane is much more widely divorced from the ordinary commercial type than is the bomber.

The Americans brought back into use arrester gear for deck landings after it had been abandoned by Great Britain. Britain first tried arrester gear, designed to catch and slow up the machine as it landed, but then gave it up in favour of a plain,



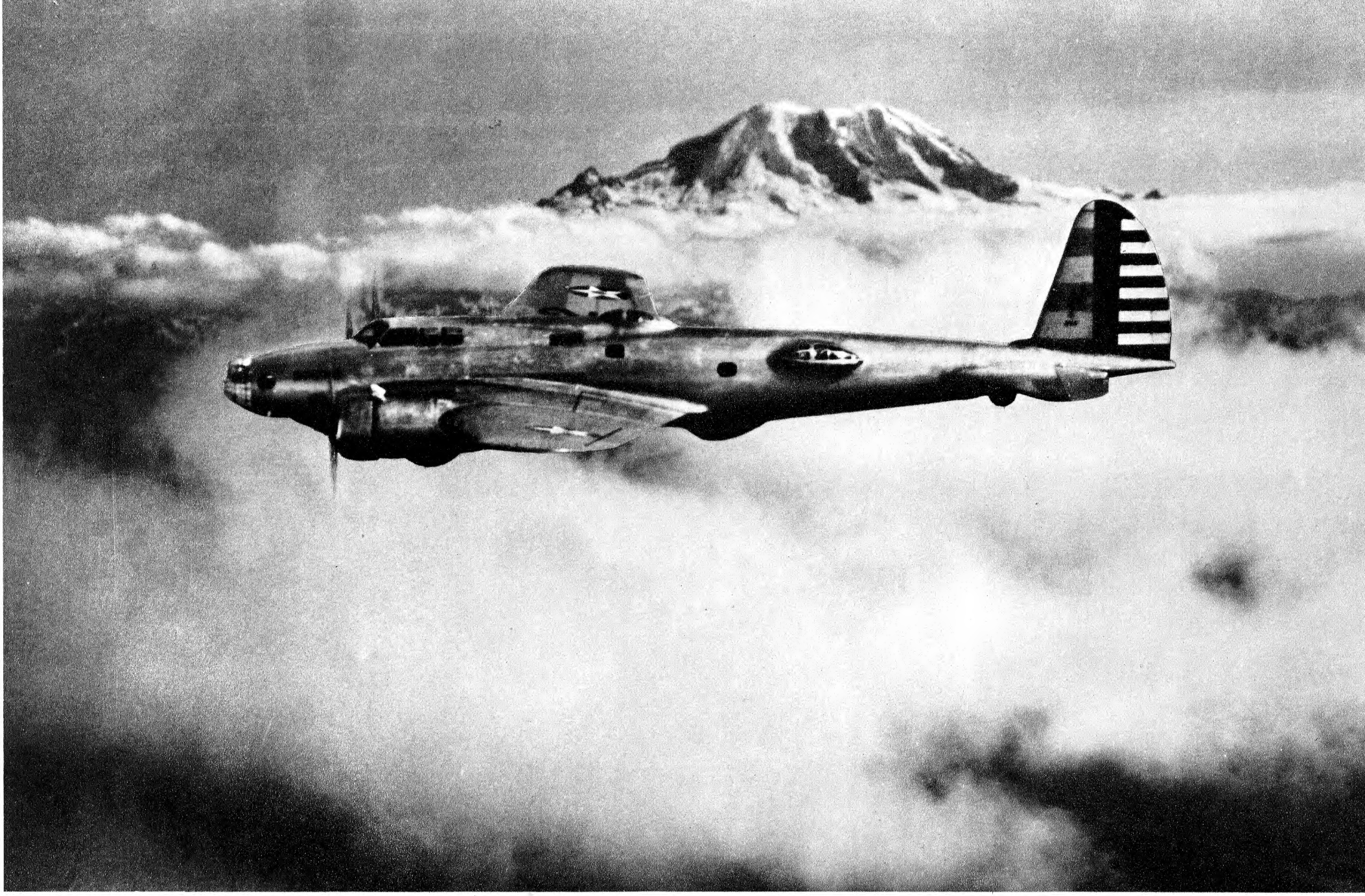
GUYNEMER—THE INDOMITABLE

Captain Georges Guynemer, the delicate young man rejected by the French army on physical grounds, the lucky hero of innumerable escapes, the idol of the French public—such was this extraordinary personality, with a fighting record of 53 victories. On September 11, 1917, although sick and advised not to fly, he went out on lone patrol, and "failed to return"; he is known to have been shot down near Poelcapelle, but he has no grave

Swissair Photo

HOW THE AEROPLANE SEES THE MATTERHORN MASSIF

From Chavez' heroic flight over the Alps in 1910 to the one-day London–Zürich air line of 1936 is a far cry; yet never does the awe-inspiring vista of Alpine peaks fail to evoke the wonder of air travellers. In the centre of our photograph is the Matterhorn, over the 14,775-ft. summit of which a modern aeroplane could fly with ease



U.S. BOMBER OF ALL-ROUND EFFICIENCY

U.S. Army Air Corps Official

Few military aircraft have created such a stir in recent years as the Boeing 299 bomber, claimed to be the largest and most powerful landplane in use in the U.S.A. at the time of its production. In 1935 the prototype flew from Seattle to Dayton (Ohio), a distance of 2,100 miles, in nine hours—an average speed of 232 m.p.h.—and above we see it in flight, with Mt. Rainier in the background.

The Boeing 299 has four 700 h.p. "Hornet" engines, equipped with variable-pitch airscrews

unobstructed landing deck. Then the American navy evolved a new type of arrester gear, or rather a modification of an old type, with cables stretched across the deck which were caught by a hook suspended below the aeroplane. This was subsequently adapted and put into use in the British fleet air arm.

These instances will show that the chief characteristic of the United States air services is their quickness with new developments. They seem to be less bound by convention than the air services of other countries, and the popularity of the monoplane, although largely due to work in France, was also partly influenced by the American trend in that direction. And in all the technical work that goes on in the United States there is always the backing of the large and well-equipped aircraft industry — an industry which is not dependent solely upon the Government for its existence, but which has many independent airline customers. Consequently, it is a more independent industry than those of countries where almost all the large orders for aircraft come from the Government and the Government alone. Possibly its independence conduces to its being more favourable to experiment and to maintaining a more open outlook upon new developments.

An excellent example of the kind of aeroplane which meets with a favourable reception in the United States air services is the recently produced Vultee V–11 attack bomber. This has a 750 h.p. Wright Cyclone engine with Hamilton controllable-pitch propeller. The machine is built entirely of metal and has a retractable undercarriage. Split trailing-edge flaps are applied to the wings to give the low landing speed of 65 m.p.h. The armament is interesting, consisting of four Browning machine-guns, mounted outside the field swept by the airscrew, but all firing forwards in the line of flight. The guns are manually charged by cockpit-charging handles and electrically fired by a trigger-grip on the pilot's control stick. Each gun has 600 rounds of ammunition. A movable Browning machine-gun is used in the rear gunner's cockpit. A total bomb load of 1,200 lb. is carried.

As a bombing aeroplane, the range at cruising speed reaches the remarkable figure, for a single-engined machine, of 2,200 miles, and the machine has a top speed, at the operating height of 11,000 feet, of 209 m.p.h. Its absolute maximum speed is 230 m.p.h. The machine is completely equipped for night operation. That is an instance of the progressive policy of the United States air services in the choice of equipment.



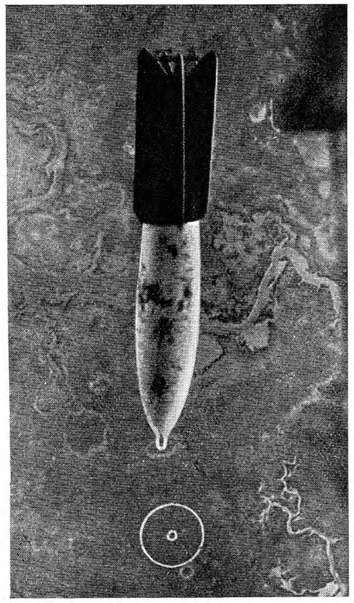
Associated Press

CAMOUFLAGE IN THE AIR

A large bomber cannot have the manoeuvrability of the enemy fighter, yet it must not be driven from its course by the latter. To combat this danger, the U.S. Army have experimented with camouflage, as seen above. The aircraft so painted are Douglas B7 bombardment monoplanes, of twin-engined gull-wing type, capable of carrying five men and a ton of bombs each

Another American service machine, now being produced in series, also serves to illustrate the technical progressiveness of this country's military aviation. The Martin bomber first appeared in 1933 and its performance came as a surprise to aeronautical engineers all over the world. Since then it has been issued to service squadrons and further orders have been placed for modified versions. The Martin B10 bomber really introduced the conception of the fast monoplane bomber in practical form. It is arranged with the wing roots at about the mid-line of the fuselage, and the two engines are mounted in the leading edges of the wings and supplied with low drag cowlings. Enclosed positions are used for all members of the crew, the front

Planet News and Associated Press



BOMBING WITH DEAD ACCURACY

A class of military aeroplane highly developed by the U.S. Army Air Corps is the fast heavily armed two-seater attack monoplane, designed for low-bombing and similar duties. An outstanding type is the Curtiss A12 "Shirke," in which the bombs are carried vertically within the fuselage. Hence the peculiar flight-path of the bombs in the picture above. Left, a bomb dropping vertically towards the practice circle 3,000 feet beneath

gunner being seated in a rotatable turret. The undercarriage retracts, but in the earlier types the tail wheel is fixed. An interesting accessory is the electric inertia starter for the engines. This aeroplane, carrying about a ton of bombs, all attached to enclosed racks, has a maximum speed at operational height of well over 200 m.p.h. Its range can be varied according to fuel load and may be 1,500 miles or more. Altogether this machine and the Vultee V–11 illustrate vividly the progressiveness of the military authorities in the United States and the great store that is set by the use of the most advanced technical knowledge.

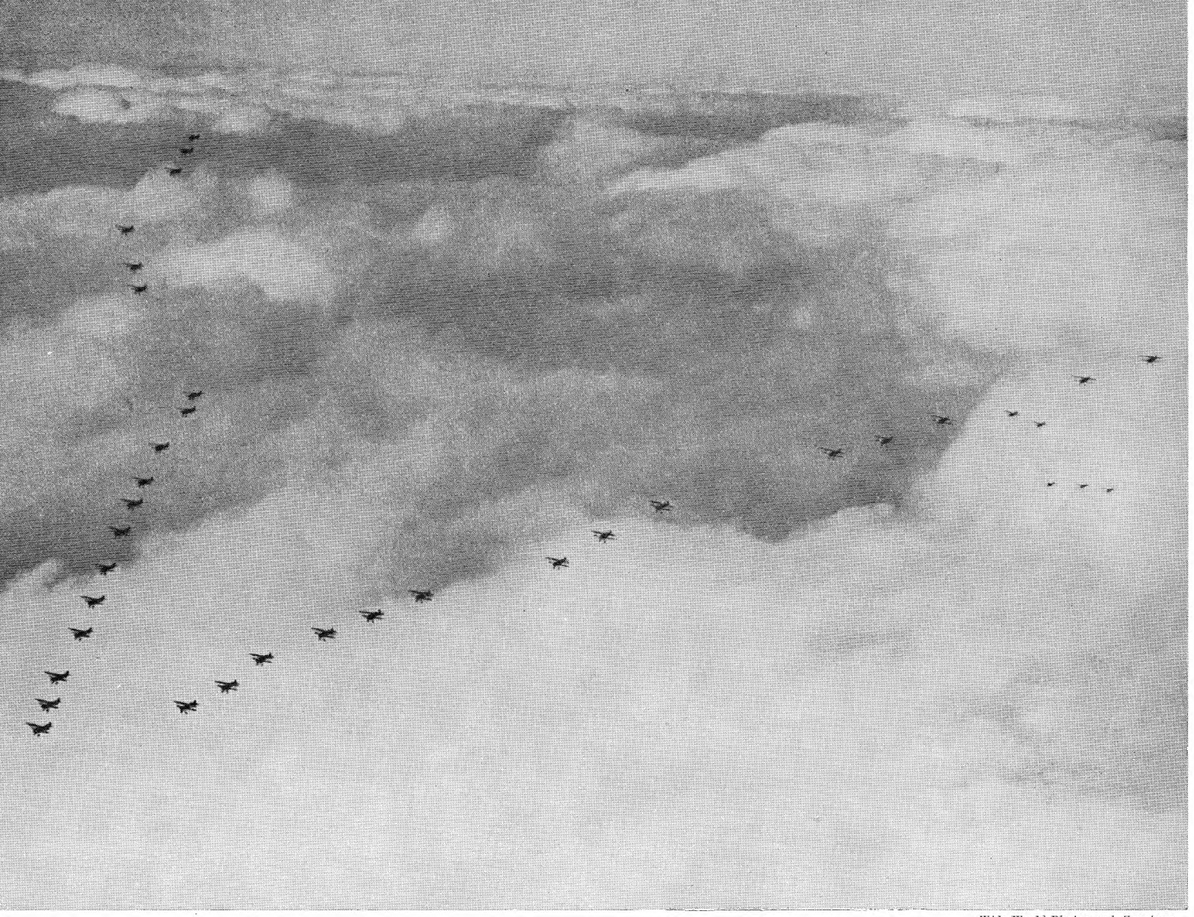
There is another direction in which the Americans are making progress so rapidly that it compares favourably with that being made elsewhere; this is in aerial armament. The American machine-guns adapted for aeroplane use are certainly the neatest of their kind, and this neatness enables them to be mounted in, for instance, the wings of the aeroplane without necessitating clumsy housings and the extra drag which goes with them. America is also watchful of armament developments abroad, and when one of the leading American aeronautical engineers was in England a short time ago he told me that a great deal of attention was being paid to the motor cannon.

This weapon originated in France, and, as is pointed out in the chapter dealing with the French air force, it has been greatly developed in recent years and is being standardized in some of the new 300 m.p.h. fighters. Its high muzzle velocity and long range are regarded by French military authorities as being of great importance for

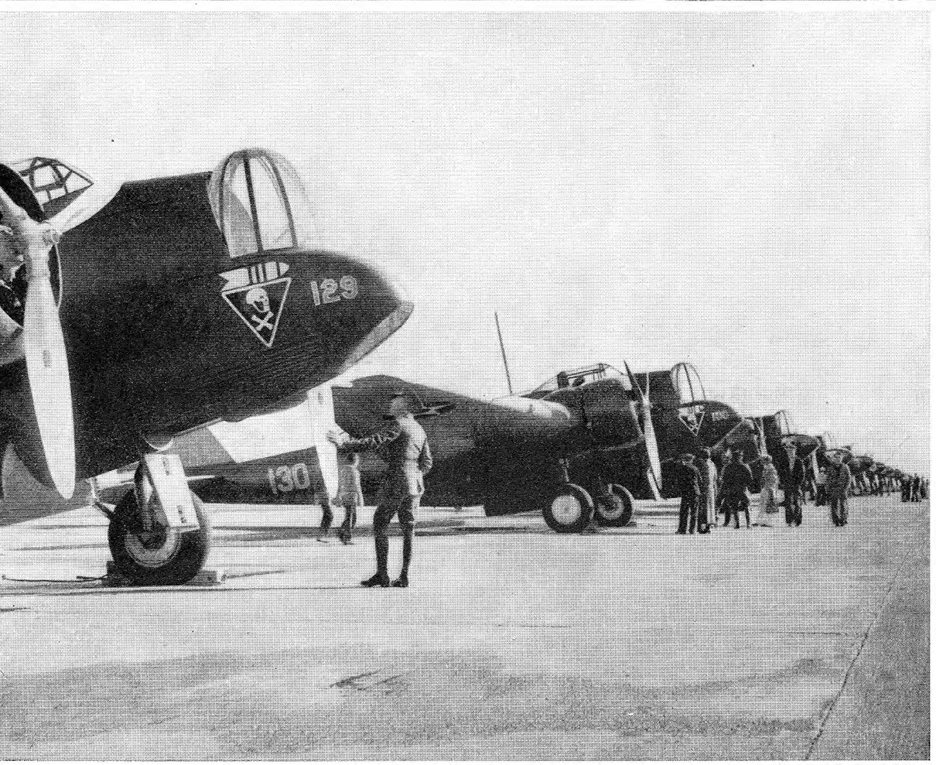
Official Photo: U.S. Navy

PATROLLERS OF THE PACIFIC SEABOARD

The huge fighting services maintained by the U.S.A. are necessitated by the size of the American continent and by her wide responsibilities. Particularly is this so in the Pacific, and the navy and marine have a large number of seaplanes based in this region. The photograph above shows Vought float-seaplanes taking part in manoeuvres off San Diego, California, in the summer of 1935



Wide World Photos and Keystone



PURSUIT AND BOMBARDMENT

Above, one-place pursuit planes, i.e. single-seater fighters, of the 95th Pursuit Squadron, U.S. army, high above their base at Selfridge Field. Below, Martin B10 twin-engined army bombardment monoplanes ranged on Hamilton Field (California). The Martin is one of the most efficient military aircraft in service today. It has two Wright "Cyclone" engines, into the streamlined cowlings of which the undercarriage is retracted during flight. The bomb load is enclosed in a deep belly beneath the fuselage



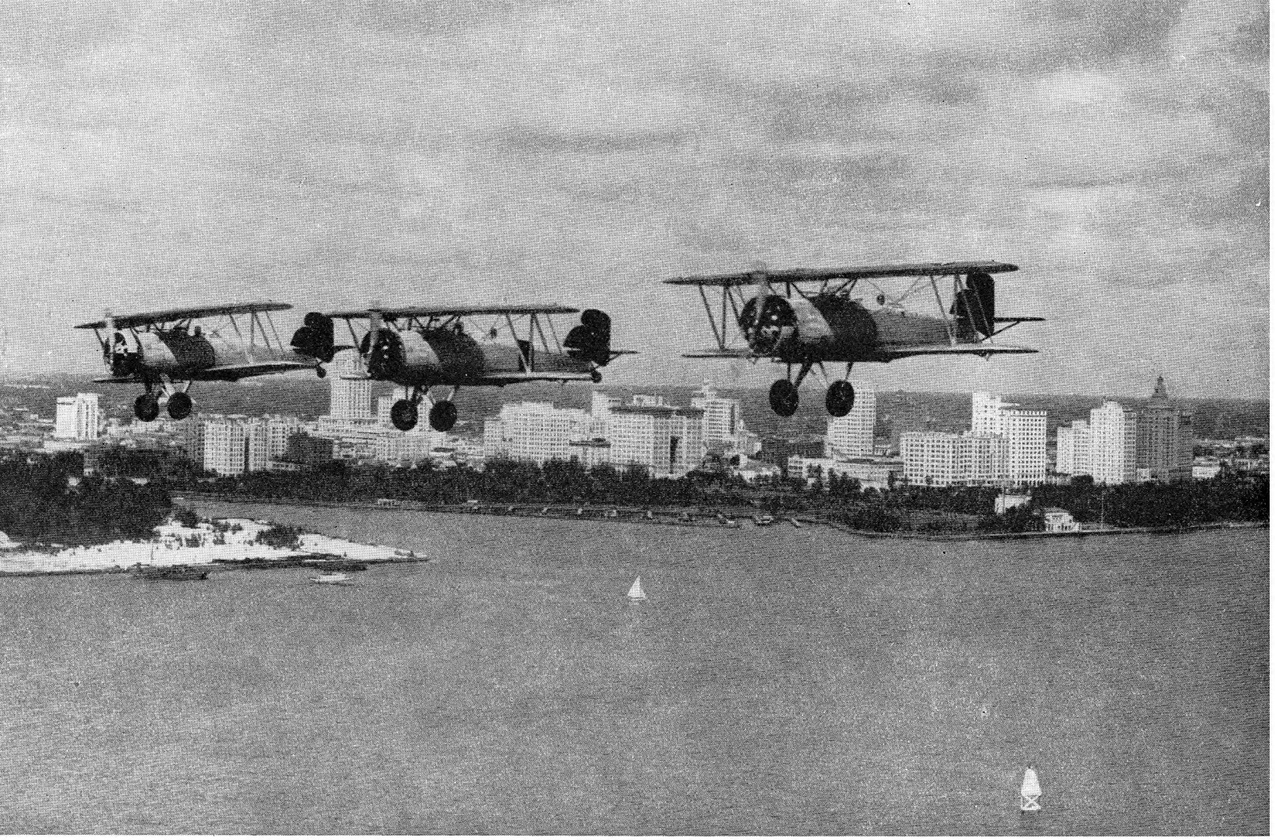
Official Photo: U.S. Navy

CRUISING OVER ICE AND MOUNTAIN

Patrol Squadrons VP7 and VP9, using PN12 twin-engined flying boats, are seen above surveying the Galombia Glacier, in Alaska, a detached possession of the United States. Only aircraft can reach this part quickly in an emergency, and even then landing grounds are few and far between. Below, a Curtiss "Condor" heavy bomber over a section of the Rocky Mountains, another wild region which, like the North-West Frontier of India, can only be satisfactorily policed by a mobile air force

Wide World Photos





Dorien Leigh

'HELL DIVERS' IN FLORIDA

One of the first types of aircraft specifically designed for dive-bombing (see page 265) was the Curtiss "Hell Diver," made famous in a Hollywood film. The "Hell Divers" seen here in manoeuvres over Miami, the popular pleasure resort in Florida, are now relegated to the Reserve, for aircraft designs quickly become obsolete

aerial combat. A similar view is held by some of the American authorities, though it has not yet hardened to the extent it has in France. But experimental work is being done with motor cannons and it will not be long before aeroplanes mounting them are found in the U.S. air force.

Of the American pilots it is scarcely necessary to speak. They not only fly with great brilliance, but they are publicised all over the world with tireless energy. If a film is shown on any part of the globe depicting an air force, it is almost certain that that air force will be American. And the manoeuvres it will do testify vividly to the skill of its personnel. American pilots are certainly as good as any, and they seem to be able to combine the brilliant individualism of the French with the team work of the English. Let me now turn to the number of aeroplanes.

Here, as in all these calculations of first line strength, one is checked by the difficulties of assessing the variable factors so as to reach a level basis of comparison. It seems probable that the United States air services now possess something in the region of 2,000 first line aeroplanes. United States statistics give a figure slightly higher, but the lowest figure quoted by any accredited authority is 1,800, and it seems certain that the number is now greater than this. The United States fleet air arm is particularly well equipped with six aircraft carriers, in each of which it is found possible to store a full complement of aircraft.

As for the future, the secretaries of war and the navy have announced the building programmes of the United States. Five-year plans have been established, which will give the army 3,000 combat aeroplanes of modern design in addition to a large number for training, transport and other purposes. The navy is to have 1,910 aeroplanes by 1940. This programme has been criticized in the United States as totally inadequate to the country's needs, and it seems probable that it will be considerably extended in the near future.

This likelihood is emphasized by the way in which American service opinion is veering towards the air arm as being the strongest and most generally useful arm for all kinds of warfare. There have been in the U.S.A., as in Great Britain, disputes between the services, and the warship bombing tests done by General Mitchell were the outcome of such a dispute. But today in the U.S.A. there is a general acceptance of the value of the air arm and so big increases may be expected.

Finally, I return to the essential advantage possessed by the American flying services—that they are backed by the largest and most powerful aircraft industry in the world. First line strength in the United States is a highly misleading basis of comparison, even more misleading than with other countries, because the U.S. capacity for air expansion is so much greater. And with that capacity for expansion goes a really advanced technique. The quality of the American service machines is probably as good as those of any other country and her capacity for expansion is greater. Can it be said that those who claim that the United States is the most powerful country in the air today are mistaken ?

Epic Flights of Famous Flyers. 12

BRITAIN'S HEROINE OF THE AIR

By William Courtenay

Air Correspondent of the 'Evening Standard'

Miss Amy Johnson was the first English girl to fly solo to Australia. She also proved her skill as pilot and navigator by setting up solo records from England to the Cape and return. She flew across the Atlantic with her husband, Mr. J. A. Mollison, being the first and only English girl to make the westward crossing successfully

WHEN Miss Johnson decided to fly she was working in a city office like thousands of other secretaries and stenographers. One Sunday she took a bus and by chance went along the Edgware Road and past the old Stag Lane aerodrome. The sight of the machines flipping lazily in the heavens attracted the girl, and she went through the gates. She felt she was a trespasser, but she timidly inquired if it cost much to learn to fly, and was told it would be about £5 for an hour's lesson, and that she could join the Club if she wished. Amy went home thrilled. She saved enough to start, joined the Club and began to take lessons.

But soon Miss Johnson was faced with a problem. To put in time at the aerodrome meant being late at the office. She had either to abandon her work or give up flying; she chose flying. She not only took her "A" licence as an amateur pilot, but also learnt all about aero engines. Only by lining up with men students at the engine shops and in the hangars could she learn, somewhat irregularly, all that was necessary to take her ground engineer's certificates. She succeeded, and was the first woman in the British Empire, if not in the world, to do so. She also put in about 80 hours of solo flying, but could not afford to do more than fly round the aerodrome. One trip to her home at Hull was the longest cross-country journey she undertook !

When she decided that Australia must be her goal, she studied her route, the weather, all the factors affecting the flight, and chose the month of May for a start, so that she might miss the monsoons and have the best weather all the way along the 13,000 miles' course. When she felt ready to go, there was the question of the cost of the machine. Captain Hope, a King's Cup pilot, had an old Gipsy Moth available at £600. Amy's mother came to the rescue and found half this sum, but the rest she had still to find.

Among those to whom she wrote was Sir Sefton Brancker, the director of civil aviation, who afterwards told me of how he had received a letter from someone who wanted to make a flight to Australia; how the person had impressed him because she had taken her ground engineer's certificates as well as her pilot's ticket; and how she had forgotten to sign the letter. This historic document is still in existence.

Brancker caused inquiries to be made at every light aeroplane club in Great Britain until he found the writer. Then he sent for Amy and told her he thought someone he knew might find the small balance of the money she had asked for. Brancker took her to Lord Wakefield, who gave her the help she needed and £50 in addition for pocket money.

And so at length, on May 4, 1930, Amy started off from Stag Lane aerodrome. She had named her Gipsy Moth "Jason," and had provided it with special fuel tanks in the front cockpit and in the rear luggage locker to give it a range of about 1,200 miles. She took practically no kit. She had chosen a route through the Balkans and made her first stop at Vienna, 780 miles from Croydon.

Fearing nothing, she went on to Constantinople, covering 790 miles on

A RECORD PENDING

Mrs. J. A. Mollison, better known as Miss Amy Johnson, added to her already world-wide fame by remarkable solo flights from England to the Cape and back in November-December, 1932. She created a record in each direction, flying out in 4 days 6 hours, and back in 7 days 7 hours. This photograph of Mrs. Mollison was taken in the cabin of the "Puss Moth" which she used on these flights

Wide World Photos





Wide World Photos

HER FIRST TRIUMPH

It was in May, 1930, that Amy Johnson, as she then was, achieved her first and most famous success. She flew alone from England to Port Darwin, in Northern Australia, in 19 days, and on to Brisbane, where the above photograph was taken. Her machine was a small second-hand D.H. "Moth," with open cockpits

the second day, May 6. She then faced the Taurus mountains and climbed to 14,000 feet to get above them, reaching Aleppo, in the Syrian desert, 550 miles from Constantinople, on the fourth day. From Aleppo she had 500 miles of desert to cross to Baghdad. Here she met her first real adventure. A 50-mile-an-hour gale sprang up, whipping the fine desert sand into a great dust-storm. She landed in the desert, where she jammed her luggage against the wheels to act as "chocks" to prevent the machine being blown over. Hours later, when the storm had abated, she re-started and flew on to Baghdad. In six days she reached India, setting up a new record for the trip. From Karachi her journey took her across India via Jhansi to Calcutta, and thence via Akyab and over the jungles to Rangoon.

Wind and rain and the monsoons into which she had flown now bestrode her path, but Amy took all before her, reaching Bangkok on May 17, Singapore on the 19th, and, after many short "hops" through the Dutch East Indies, completing the flight at Darwin on Empire Day, May 24. Her crossing of the 500 miles of the Timor Sea was as brave an achievement for a young girl as anything anyone could face.

Her next effort was a flight to Japan via Russia. This was first attempted in January, 1931, in the intense cold of a North European winter. Starting from Stag Lane aerodrome on January 2 in a Gipsy Moth, she reached Poland on January 4. A forced landing in fog at the village of Amelin and a slight mishap were the chief adventures. After that she went by train to Moscow to find the cold worse than anything she had ever experienced, and at the urgent representations of expert Russian airmen the flight was abandoned.

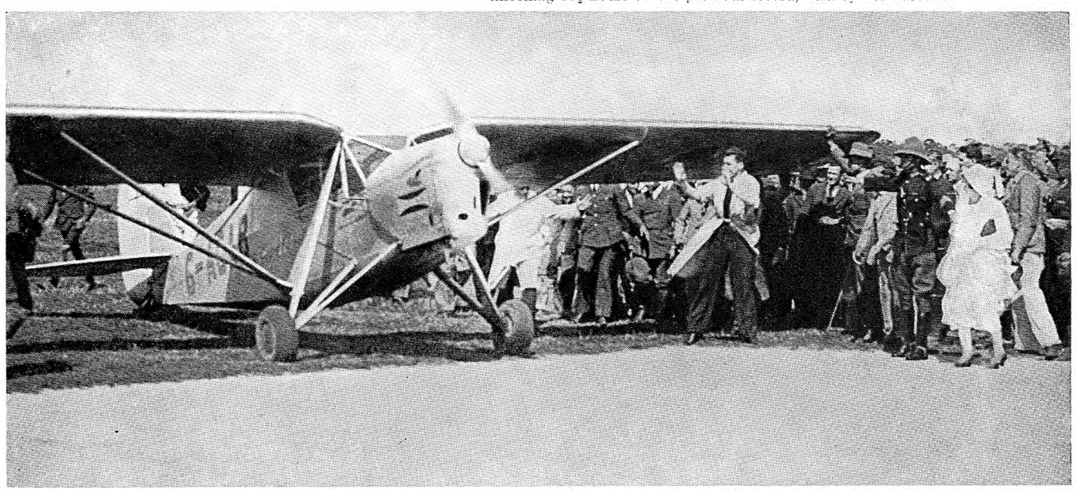
But by July of the same year she had purchased her first Puss Moth, the new cabin monoplane just coming on the market. This gave her a cruising speed of 105 m.p.h. as against 85 m.p.h. in the biplanes she had hitherto used, and it was possible to fit special fuel tanks to increase the range to 2,000 miles or more. Further, she could now fly in comfort without being exposed to weather as in an open cockpit machine.

By now her plans were more perfect and the weather conditions more favourable. Starting on July 29 from Lympne, she made a magnificent flight of 1,650 miles direct to Moscow, and finally reached Tokyo in the record time of nine days. She flew back in 18 days and was thus the only aviator, man or woman, to complete the double flight. In August, 1932, Miss Johnson married James A. (Jim) Mollison, the hero of record flights to and from Australia and South Africa that are described in pages 576–80.

Mrs. Mollison's most cherished dream was then shelved to allow her husband to make the first westward solo crossing of the North Atlantic. On his return they agreed she should attempt the Cape record and lower Jim's time of 4 days 17 hours 19 minutes. I was associated with Mrs. Mollison in the preparations for this flight and in looking after all the business and other details for her. In this I had the warmest collaboration and help from Jim, who was certainly pleased to see his wife lower his own excellent time.

HEROINE OF EMPIRE

Most of Amy Mollison's record-breaking flights have been along the "all-red routes," and her solo records to and from the Cape at the end of 1932 were no exception. Below, Mrs. Mollison taxi-ing her "Puss Moth," named "Desert Cloud," in at Cape Town after knocking 10½ hours off the previous record, held by her husband



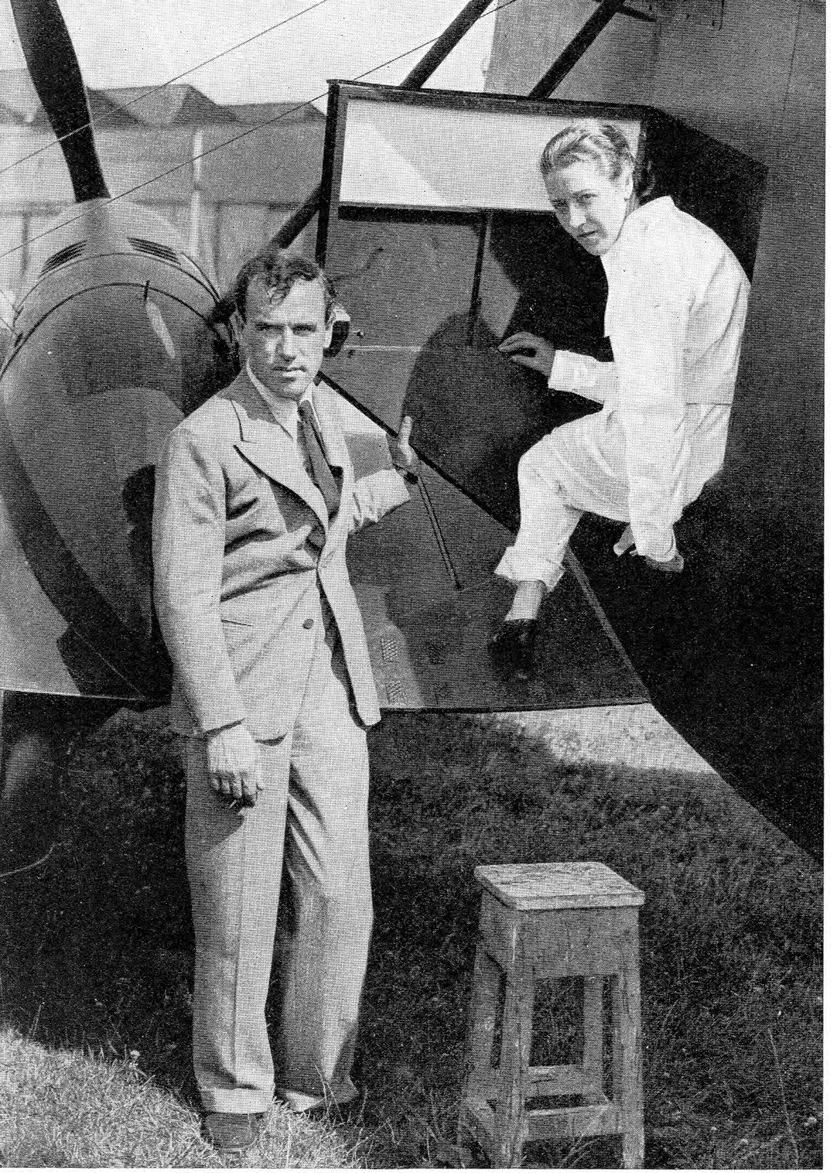


Photos: 'Daily Mirror'

SAGA OF THE 'SEAFARER'

Pendine Sands, Carmarthen, once the scene of motoring speed-record attempts, was chosen by Mr. and Mrs. Mollison as the starting point of their joint east-to-west Atlantic flight in September, 1933. This, their second attempt, was made in a specially built D.H. "Dragon," christened "Seafarer II." Above, an aerial view of the sands before the Mollisons' departure; and below, the "Seafarer" on the first overland stretch of her great non-stop journey to the New World





Keystone

PRELUDE TO JOINT ADVENTURE

The world was amazed at the temerity of Jim and Amy Mollison in contemplating an Atlantic flight together—and the difficult westward crossing at that—but events were to prove that their combined skill, plus the necessary luck, would pull them through once again. Above, the famous pair at Stag Lane aerodrome with their second D.H. " Dragon." The first " Seafarer " was wrecked in a false start at Croydon

Like Jim, Amy now chose a Puss Moth, which was named Desert Cloud. It was fitted with the latest blind-flying instruments and with special tanks to give it a range of over 2,000 miles. Jim, Amy and I had flown to Lympne from London over a week before the flight started in November, 1932. Then followed the week of waiting for good weather reports.

The West Coast route had been chosen, this being the one used by her husband. At the last moment the French Government brought out a new rule requiring a deposit of £1,200 by any aviator crossing the Sahara. This was to meet the costs of any search by the French Air Force.

It was at 6.37 a.m. on Monday, November 15, 1932, when Amy took off at Lympne, Captain Jeffs, the control officer, flooding the aerodrome with powerful night landing lights in order to assist the long take-off in the dark morning. Jim and I bade her good-bye and stood anxiously on the aerodrome until she was safely in the air and had turned on her course across the Channel.

Amy had intended making Oran, in Algeria, 1,200 miles away, but she landed at Barcelona at 2.20 p.m. to refuel. It appeared later that she was not quite sure of the range of her new Gipsy III engine. An hour later she was off, and Oran was safely reached the same night. By her flight she lowered her husband's record by the handsome margin of 10 hours 29 minutes—her time being 4 days 6 hours 53 minutes.

Early in 1933 Mrs. Mollison flew back to England in under seven days, thus capturing the homeward record from Captain C. D. Barnard, and being the only airwoman who had flown solo in both directions.

In the year 1933 Amy and Jim settled down to work out plans for their most ambitious project—the winning of a new non-stop record for Great Britain and the first double crossing of the Atlantic. Two officers of the Royal Air Force, Squadron Leader Gayford and Flight-Lieutenant Nicholetts, had, in 1933, set up a record of 5,300 miles by a magnificent flight from Cranwell to Walvis Bay, in S. Africa, in a Fairy-Napier long-range monoplane. But Rossi and Codos, two French airmen, had beaten it soon afterwards with a flight of 5,600 miles from New York to Rayak, in Syria.

Amy and Jim had a Dragon twin-engined air liner built at De Havilland's, and this contained huge cylindrical petrol tanks in place of the seats for the usual ten passengers. Loaded with 600 gallons, they counted on a range of 7,000 miles—more than enough to reach Baghdad non-stop from New York with the aid of a following wind.

In May, 1933, the first attempt was made. A start at dawn was attempted in order to make landfall in daylight on the other side. This was to be the first direct flight from London to New York. With Captain Jeffs I motored over to the starting point to watch the machine take off. It had hardly run 200 yards when the undercarriage collapsed and the two pilots, who had pinned all their faith and hope on this venture, had the humiliating experience of motoring back across the aerodrome before the cheers had died away.

This hitch was providential, for I now doubt if they would have got off from Croydon with the load of fuel on board, and disaster might have overtaken them. A search for a longer runway was made and we chose Pendine Sands, in Wales, where miles of firm golden sand gave an ideal site. It was August before the machine was repaired and ready again,



Keystone

AFTERMATH OF CONQUEST

The Mollisons, like other but less fortunate aviators, crossed the Atlantic safely, but crashed badly on landing. Utterly exhausted, and with their machine's fuel tanks empty, they had attempted to come down at Bridgeport, Connecticut. In the dark, the approach was misjudged, the " Seafarer " wrecked and both pilots injured in their hour of success. Above, Mrs. Mollison being assisted from an aerial ambulance at New York

and early in September when the start could be made. Seafarer II, as the great black Dragon was called, rose after a fair run of 1,000 yards at Pendine and, watched with anxiety by the crowd assembled on the sands, soon headed for Ireland and the open sea.

Carrying from 400 to 450 gallons of petrol for the " hop " to New York, and instruments sealed by Commander Perrin of the Royal Aero Club for the attempt on the world's non-stop record afterwards, Seafarer had set off on her adventure. I flew back to London after Amy had hurriedly given me her gold cigarette case and other valuables as she was climbing into Seafarer for the last time. No doubt some presentiment had told her that they might be in danger.

In London I spent the evening of the next night, a Sunday, at the tapes of a daily paper while news that they had been sighted on the other side after thirty hours in the air began to come through. Gradually, as they turned down the American coastline and were sighted at town after town in the gathering dusk, the news was flashed to London.

Suddenly, there came the crash at Bridgeport; the silence from the machine; deathlike whiteness on the tapes, and the humming of a thousand phone calls to the hospital in Bridgeport where the injured flyers were, while their machine lay overturned in the mud on the aerodrome boundary.

At 5 a.m., when the last London editions of the morning papers were going to press, we were still without any conversations with the flyers themselves for an account of what had happened, for no one was allowed to speak to them. I retired disconsolate to my hotel and at 6 a.m., as I arrived there, I had a brain-wave. I put a call through to the Atlantic telephone service and got through to the hospital at Bridgeport in five minutes. The doctor spoke to me.

After having explained to him that I was the personal representative in London of Mr. and Mrs. Mollison, I asked for an account of what had happened and requested to speak to either of them if fit enough. Within a few moments a nurse was holding the telephone over Amy's bed and she told me, in thrilling though tired accents, of the dashing of the cup of success from their lips just when victory was in sight.

It appears that their flight had, owing to head-winds and bad weather, taken nearly 36 hours and that their fuel was almost consumed as darkness came over them flying down the coastline. There were many aerodromes at which they could have landed, but both determined to try to reach their goal. Another 100 miles or so and success would have been theirs. Even when the last ounce of fuel was consumed, as they hovered over Bridgeport and glided in to land in the darkness, the remainder of the flight might still have been completed. But in the darkness they slightly undershot and landed in soft mud, which overturned the machine.

Lord Wakefield generously replaced the machine, but by the time the special fuel tanks were salved, brought home, repaired and fitted to the new machine which had then to be shipped out, the summer months had gone and no further attempts to take off with 600 gallons for the great flight to Baghdad could be made successfully. An attempt was, in fact, made, but the machine, so heavily laden, staggered back to earth. Not until the MacRobertson Australia race of October, 1934, did Jim and Amy Mollison have an opportunity of thrilling the world with another boldly conceived effort.



IMPERIAL LINER WITH SEVEN SISTERS

Charles E. Brown

Since its introduction in 1931, the Handley Page 42 class of air liner, eight machines of which (including "Helena," illustrated above) are in regular operation by Imperial Airways, has proved its worth. This class represents one of the biggest advances in commercial design yet made. The H.P. 42 has four Bristol "Jupiter" engines of 400 or 555 h.p. each, giving an ample power reserve, and weighs 30,000 lb. fully loaded

World's Wonder Planes. 14

LUXURY LINERS OF THE AIR

By Robert Brenard

Author of 'The Romance of the Flying Mail'

Today the traveller by air need not be without any of the luxuries to which the modern hotel and the latest Pullman car have accustomed him. The air lines of Britain, the United States and France vie with each other, and with the railway and steamship companies, in providing every possible requirement of luxury travel

COMMERCIAL aviation, in its early days, gave speed and little else. But, after a time, it managed to combine reliability with speed; while, as a third stage, it was able to combine a reasonable amount of comfort with those other two attributes of speed and dependability. A fourth stage was reached when moderate comfort gave place to an aerial luxury equal to that provided by the most luxurious forms of surface transport.

In the first small air expresses passengers sat in tiny, noisy cabins, and, if they wanted any refreshments while in flight, they had to take sandwiches up into the air with them. After this came larger craft, which boasted a cabin boy in uniform to look after the luggage. These machines were followed by still larger craft, in which it was possible to carry a man steward who presided over a small buffet at the rear of the saloon, from which he could serve light refreshments while in the air. The ministrations of these first flying stewards were augmented by luncheon baskets, which passengers could obtain at main airports before ascending. Those, briefly, were the phases which preceded the introduction of the first air liners which could really be said to inaugurate an era of luxury on the airways—the fleet of giant H.P. 42 machines built for the main lines of Imperial Airways by Handley Page Ltd.

In the design of these machines the aim was fourfold. In the first place, it was intended that they should have such a reserve of engine power as to obviate, to all intents and purposes, any risk of forced landings. In the second place, they were to have a staunchness in construction that would ensure them a long working life even under arduous commercial conditions. In the third place, they were to have passenger saloons of a size and luxury never before provided in any kind of air machine; and, in the fourth place, every effort was to be made to reduce the noise in the saloons.

It is no exaggeration to say that the size and equipment of these air liners

LUNCHEON IS SERVED

On the main European and Empire routes of Imperial Airways, first-class meals are provided by stewards using a fully-equipped buffet. Below is an everyday scene on board the Short "Scylla" liner, which carries thirty-nine passengers and a crew of four. Lunch is served in one of the tastefully decorated and soundproof saloons, while luxurious chairs, adjustable head-rests and large windows ensure a comfortable journey

Topical





Photos: Topical

IN THE BOWS OF 'SCYLLA'

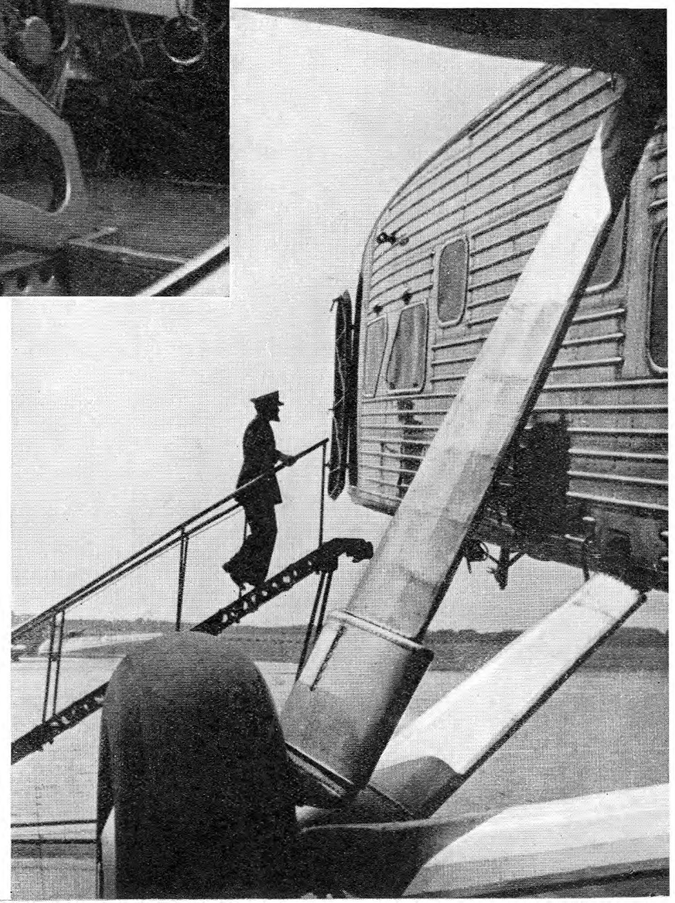
Imperial Airways are fully alive to the nautical tradition of the great country they represent, and their system is largely based on this idea. Above, the bearded and uniformed Captain O. P. Jones on the bridge of the "Scylla." Full dual controls are provided, while in the foreground is the tail-trimming gear. Right, Jones ascending the gangway to take command

—that were known as the Heracles and the Hannibal class — came as a complete revelation to the air-travelling public. In their impressive size, in the power of their large motors, and in the spaciousness of their internal equipment, they transformed an air journey from a primitive sort of adventure into an experience in which speed and luxury were combined in a way that had never been possible in any form of transport before.

Machines of a biplane type, with a wing-span of 130 feet, the H.P. 42's have an arrangement of the lower wing which ensures an adequate view from all saloon windows. The four engines are mounted on the wings, away from the fuselage, thus lessening noise and vibration in the saloons, while the cabin walls are lined with special sound-deadening materials. The result is that when these air liners are flying at full speed it is possible to converse in the saloons without any need to raise one's voice. Passengers travelling in these machines have luxurious armchair seats, with tables and shaded lights such as one would find in the latest railway Pullman cars; while there are efficient systems of heating and ventilation.

As operated on the London-Paris route, these Handley Page air liners carry a couple of uniformed stewards, who have a buffet so completely equipped that five- and six-course luncheons and dinners, either hot or cold, can be served in the air on just the same scale as in any first-class hotel or restaurant on the ground. A varied wine list adds to the amenities of these wonder-planes, while special airway cocktails are also available.

A regular aerial catering department has been established at main airports by Imperial Airways, and it is the boast of this department that no tinned food of any kind is employed in the service of meals in the air. The dishes are cooked from fresh materials in the kitchens at the airports, and are then



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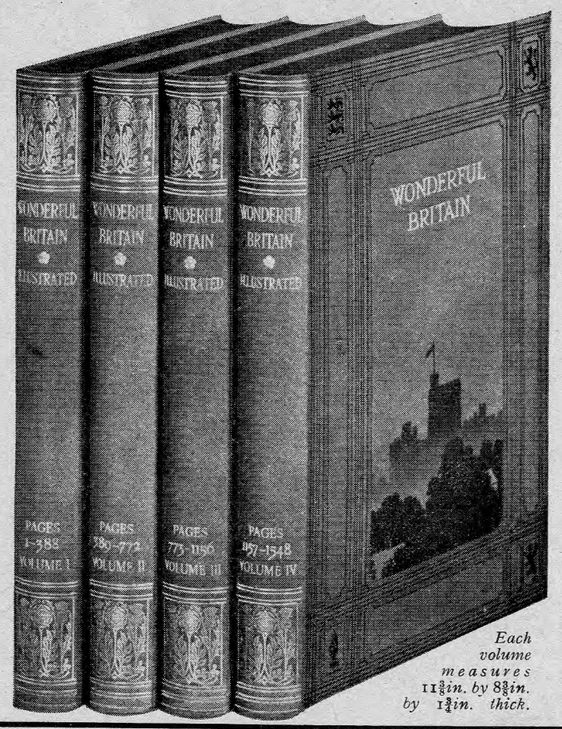

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WAR in the AIR

AERIAL WONDERS OF OUR TIME

SIR JOHN HAMMERTON
Editor



Editorial Eddies

John Carpenter House, London, E.C.4.

IN this Part of WAR IN THE AIR the two concluding chapters deal with a success and a disaster respectively. The success is the remarkable career of Amelia Earhart, the American girl who made her first important flight in 1928, when she was a passenger on a plane named Friendship that was piloted by Commander Wilmer Stultz. Four years later Miss Earhart set out upon a much more ambitious undertaking. On May 20, 1932, she left Harbour Grace, Newfoundland, in a small machine which alone she piloted across the Atlantic. As the writer of this chapter says, "It had been a nerve-racking flight, and when, after the landing, the petrol tanks were examined, it was found that there was just sufficient fuel for one hour's flying—a narrow margin indeed." She followed this up by a flight from Honolulu to California, where she landed after having covered 2,408 miles in 18 hours 16 minutes.

THE disaster described is the flight of Salomon Andrée and his two companions to the North Pole. They went in a balloon which was built in 1896–97 and was called the Eagle. Danes Island, in Spitzbergen, was the starting place, and the date when they set out was July 11, 1897. Nothing more was heard of them for three years when, on August 27, 1900, the first buoy dropped overboard was found. In it was the message: "Our journey has hitherto gone well. Weather magnificent." Then there was another and longer silence, and soon the explorers, who had certainly met their deaths, were forgotten. In 1930, however, Andrée's diaries were found, and from a perusal of these the story of the ill-fated adventure has been put together. As stated, they set out on July 11, and the diary carries the story down to October 5, when the writing becomes illegible. They had been drifting for two months, and their last resting-place was White Island, where they met their deaths, which were not due to starvation.

FROM time to time I receive letters from the younger among my readers asking how they can enter the Royal Air Force or some branch of civil aviation. I reply to these letters individually, giving such information as I can, but having noticed an article in the "Evening Standard," by Mr. Wm. Courtenay, who has contributed several valuable chapters to WAR IN THE AIR, I am tempted to say something about this subject on this page. It seems that some little time ago Imperial Airways decided to recruit each year a few youngsters of good education, and, after having trained them, to give them an opportunity of a career in the Company's service, chiefly in looking after stations in distant parts of the Empire. It is not surprising that from the public schools hundreds of young fellows applied for these coveted posts and the task of reducing the number to a short list was not an easy one. The main difficulty was not to test their health and educational attainments, for this was comparatively simple; it was to find out whether they possessed the temperament necessary for life in spots remote from civilization.

IN order to solve this problem Imperial Airways approached the National Institute of Industrial Psychology. The youths were put through vocation tests and from these there emerged a few who, after pyschological examination, were found best able to endure life at the distant stations of the Company. During the past five years some forty youths have been taken on by this method. They spend the first two or three years being trained in London and during this time are paid a small salary. When the training is over they are sent out to take up positions as station superintendents or as assistants in that branch of the work.

READERS who did not see the article in question may be interested to know what were the tests that were carried out by the National Institute. These are classified as follows:

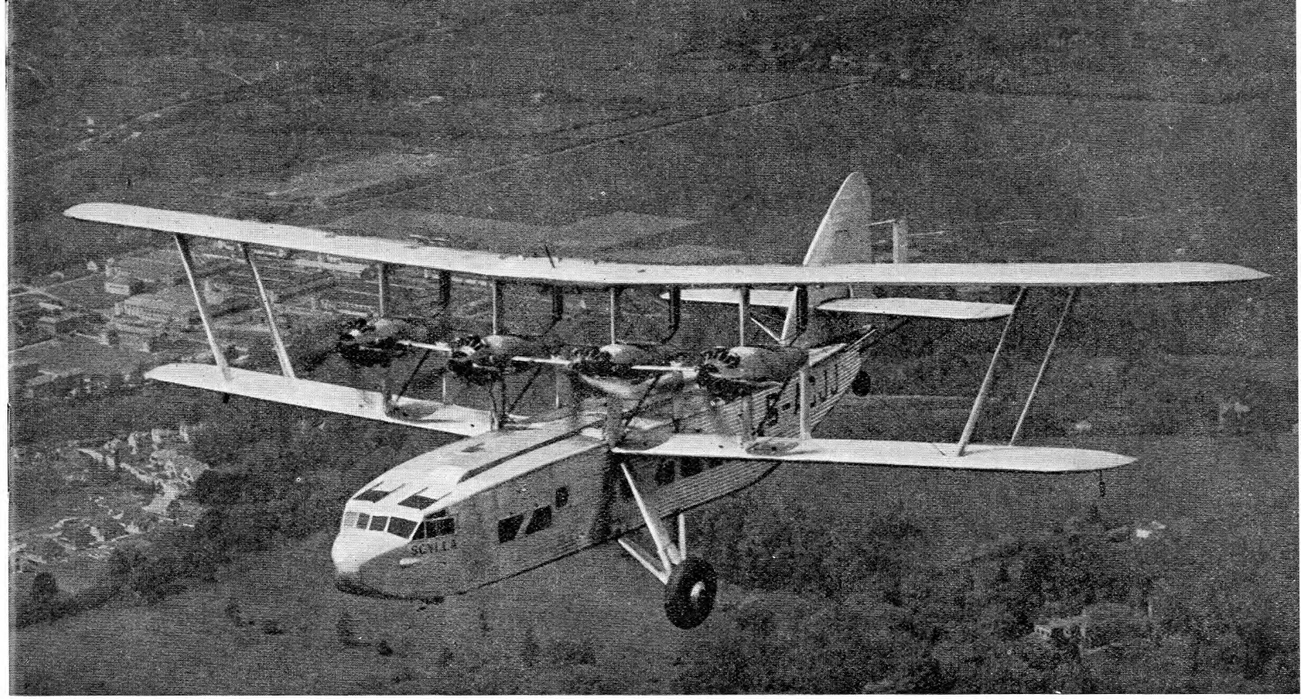
1. An intelligence test of inborn general intellectual capacity, and not of mere acquired knowledge.
2. Performance tests. These were non-verbal problems involving planning with concrete materials to prove practical ability.
3. Form relations test. This was done to examine ability to judge spaces and sizes for constructional work.
4. Memory for design test.
5. Manual dexterity test.
6. Clerical test for speed and accuracy, including memory for instructions.

THE designing of aerodromes is already a recognized branch of architecture, and to judge by the contents of a recent number of "Flight" it should be a profitable one. This journal gives some particulars about the Airports Exhibition that was opened at British Industries House, Marble Arch, London, on January 30 last, by Sir Philip Sassoon, Under-Secretary of State for Air. At this exhibition more than seventy firms showed samples of equipment used at, or suitable for, a modern airport. About the same time the Aerodrome Owners' Association was holding its annual conference, at which the three chief matters discussed were the building of an aerodrome, the planning of a municipal airport, and the system of radio communication in use at these centres.

IN the same issue "Flight" has photographs of the plans of projected aerodromes, including one that will be built at Liverpool, another at Gatwick, and a third, which seems to me the most attractive of all, that is now in the course of construction on the island of Jersey. The progress that municipalities are making in the provision of airports will be seen from some information contained in another part of the paper. According to this, twenty-seven towns in Great Britain and Northern Ireland possess licenced aerodromes, eleven others have purchased sites, four more have reserved sites in town-planning schemes, and 112 have inspected sites.

PART 2 of the *Encyclopedia of Modern Knowledge*, which is now on sale, contains, in addition to a variety of other matter, a contribution from Prof. H. Levy, of the Imperial College of Science and Technology, who, as many of my readers will remember, some time ago gave a remarkably interesting series of talks on the wireless on The Web of Thought and Action. In Man in the Machine Age, the article with which I am here concerned, he explains very lucidly and examines very thoroughly the results of the modern urge for mechanization, which, he says, "has succeeded beyond his (i.e. Man's) wildest dreams." But its very success has raised problems of the first magnitude and these the present generation has to face.

Order Part 23 of WAR IN THE AIR Today—On Sale Everywhere Thursday, April 9

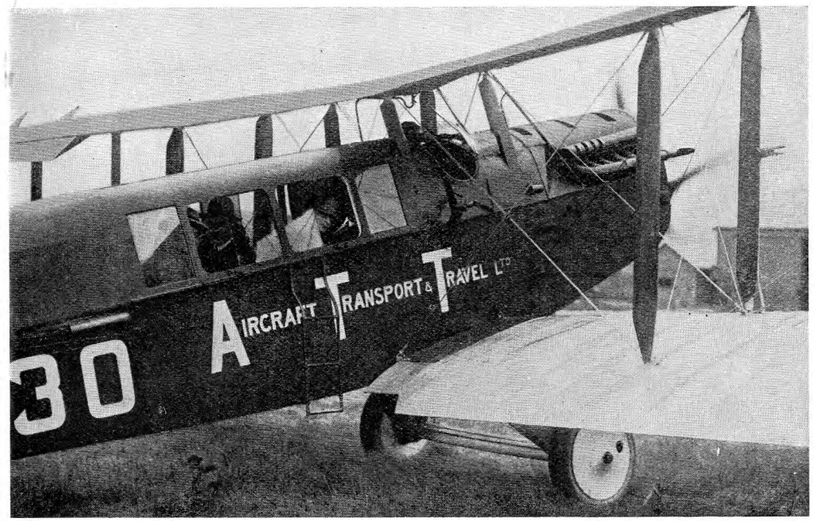


Topical

A MAIN-LINE GIANT

Imperial Airways, adhering to their policy of using a few exceptionally large and luxurious liners, added the Short "Scylla" (above) and her sister-craft, the "Syrinx," to their cross-Channel fleet in 1934, owing to increased traffic demands. The superstructure is almost identical with that of the "Scipio" flying boat (see page 692)

placed in special containers in the buffets of the air liners, being ready for service as required. This aerial catering service embraces not only the European routes, but also a regular service of meals while passengers are flying over thousands of miles of Empire airways, and so necessitates the provision of a great variety of dishes according to the changing climatic conditions. Business men who make midday flights in the air liners between London and Paris can ask for a glass of sherry or a cocktail as soon as they take their seats in the saloons at Croydon. Lunch is served while the aircraft is flying high above the Channel, and the Paris airport of Le Bourget comes into sight at just about the time coffee is being finished. This led one regular traveller to remark: "Paris, by air, is now just within easy lunching distance of London." Summer and winter, nowadays, these big aircraft maintain an evening service to and from Paris, and it is while they are on these night flights that deft, white-coated stewards serve their passengers with a six-course dinner.



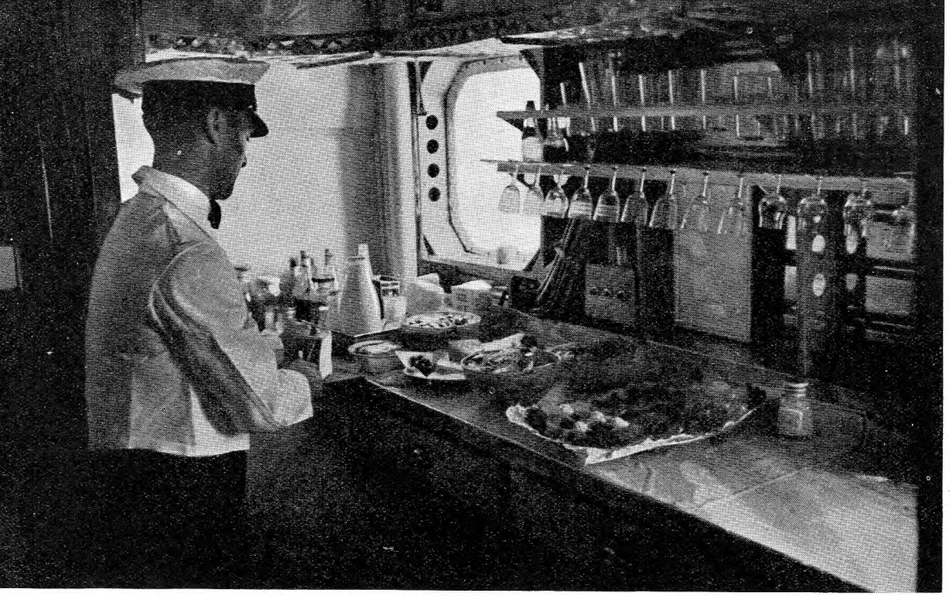
L.N.A.

FIRST LINK OF FAMOUS LINE

British operators were early in the field of aerial transport between London and Paris when the Great War came to an end, and in 1919 a regular service was established between the two capitals. Here is one of the first machines used on the route. It is a converted D.H.4 bomber piloted by Captain Lawford

To see luxury air transport in its most modern form one needs to glance into the saloons of one of these giant machines while it is on a night flight between London and Paris. A mile or so above mid-Channel the 14-ton monster wings its way, and in its saloons 20 or 30 passengers sit reading, talking, sleeping or playing cards, just as they would in any long-distance luxury train, quite oblivious of the fact that they are moving thousands of feet high through the night sky.

Two types of H.P. 42 are employed by Imperial Airways. One, the Heracles type, is equipped specially for use on the main European air lines. Machines of this class carry 38 passengers, in addition to a captain, first officer and two stewards. These Heracles machines are driven by four engines, each developing



Topical

CHEF OF THE PARIS AIRWAY

This photograph shows one of the two stewards in his compact kitchen on board the "Scylla," operated by Imperial Airways on cross-Channel routes. Excellent meals are provided during flight, and a well-equipped bar is another feature. On the "Silver Wing" midday service to and from Paris, an excellent lunch is served to passengers during the liner's smooth 2¼ hours' flight

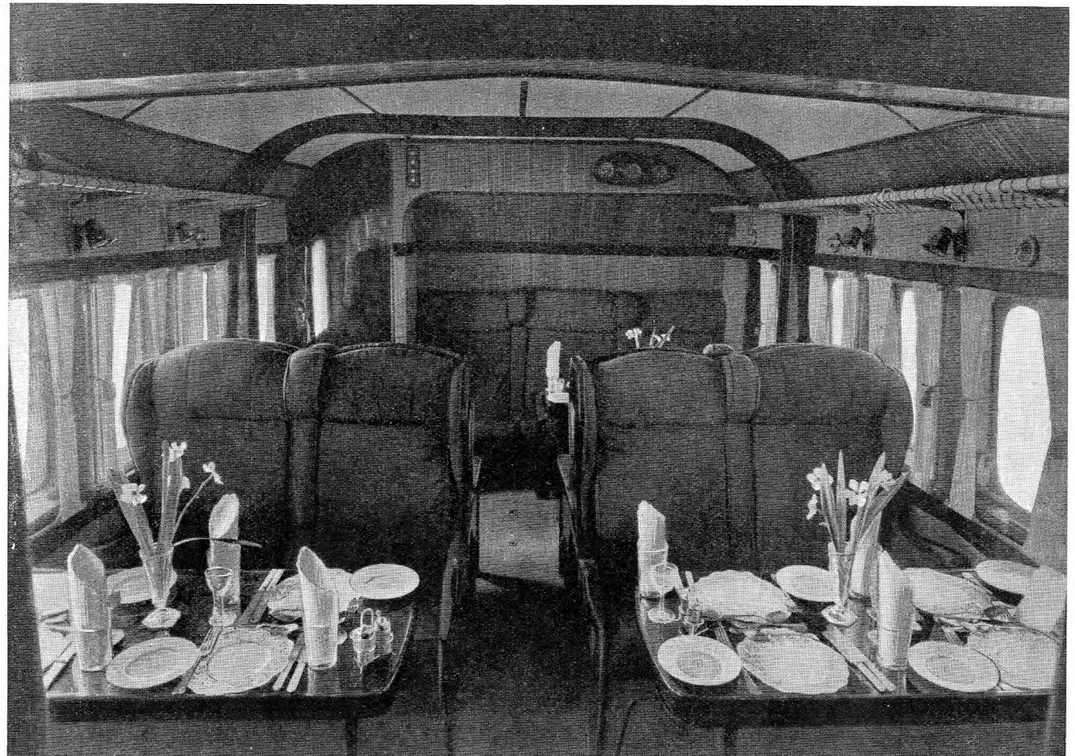
555 horse-power, and attain a speed of 130 miles an hour. The Hannibal type of H.P. 42 is equipped internally for operating in tropical or semi-tropical conditions on the main Empire air routes. In order to allow a maximum of space for each individual traveller when flying under such conditions, the saloon seating is arranged for 24 passengers, while machines of this type can carry 2,443 lb. of mails and freight. They are driven by four engines, developing 490 horse-power each, and their crew comprises a captain, first officer, wireless operator and steward.

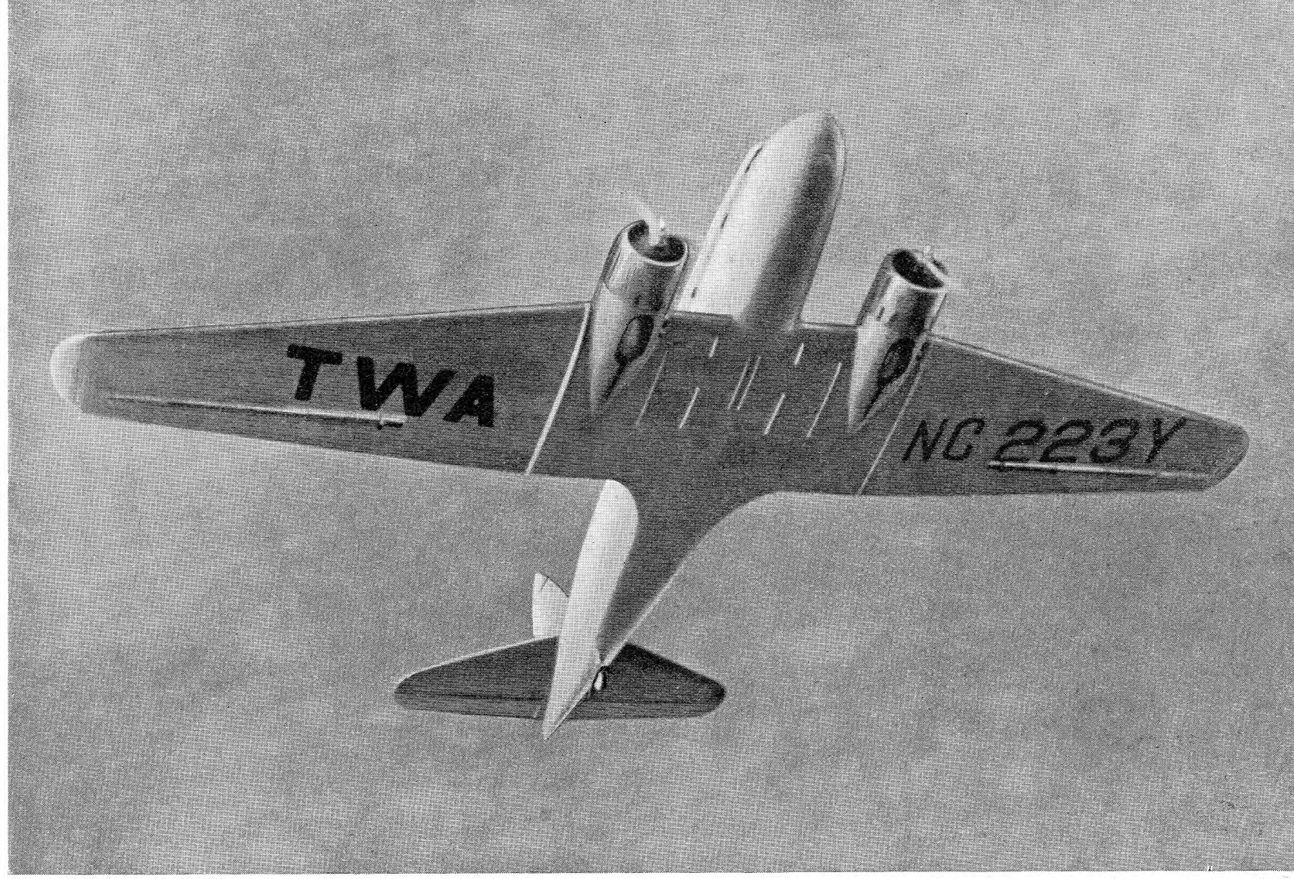
Traffic demands on the Continental routes have led to the introduction of new British air liners of the Scylla type. These luxury craft have saloons so spacious that they are actually larger than those of a railway Pullman car, providing armchairs for 39 passengers. Machines of the Scylla type are driven by four motors, each developing 555 horse-power, and their crew comprises a captain, first officer and two stewards. Similar luxury to that which passengers enjoy in giant landplanes is also provided by the big 14-ton flying boats of the Scipio type, which maintain the Mediterranean links of the Empire air routes. These machines have 16-passenger cabins.

In the United States, luxury air travel has been faced by the problem, not only of providing passenger accommodation which is the aerial equivalent of that on famous American trains, but also of

COMFORT INSIDE A FLYING BOAT

This is the spacious and comfortable saloon of one of the Short "Scipio" class of flying boats used on the Mediterranean section of our Empire routes. This section, from Brindisi to Alexandria, is at present the only stretch of Imperial Airways' routes which is covered by seagoing craft, but a fleet of great new boats is under construction by Short Bros. for extended Empire services





Keystone and K.L.M.

'FLYING HOTEL' IN WORLD USE

The Douglas DC–2 Transport, known as the "Flying Hotel," is an example of the high-speed air liner of advanced design. Developed in the U.S.A., and also built under licence in Europe, the DC–2 has two 710 h.p. Wright "Cyclone" radial engines, and carries 14 passengers and a crew of three at a top speed of 215 m.p.h. It is an all-metal low-wing cantilever monoplane with a retractable undercarriage. Above, a Douglas in service with the American T.W.A. company; and below, a K.L.M. (Royal Dutch) liner as used on the Amsterdam-Batavia route





supercharged engines and controllable-pitch airscrews, give to it an operating height of 11 500 feet, a maximum speed of 210 miles an hour and a cruising speed of 190 miles an hour, carrying its crew and 14 passengers.

The saloon of this Douglas air liner is just over 26 feet long. Each passenger in it has his or her private window, while, owing to the height of the saloon above the wing, an excellent view is obtained from all seats. Each passenger travelling in this luxury plane has an individual reading-lamp and receptacle for books or magazines, together with such additional amenities as a portable lunch-tray, an ash-tray, a call button for summoning the attendant and a lever for controlling ventilation.

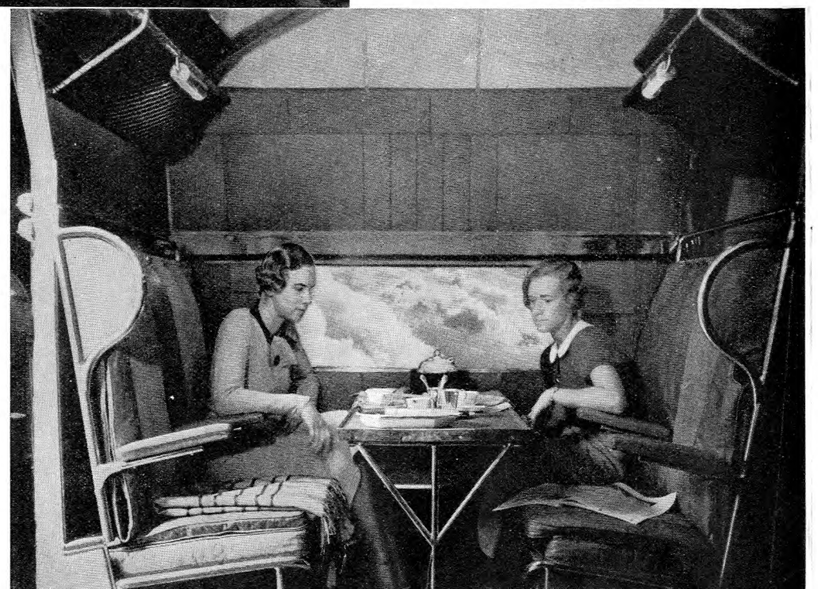
An interesting feature in the operation of these Douglas air liners on the chief American air lines is that, instead of being staffed by men stewards, as is the case with the big British air liners, each of them carries a girl attendant, who is known as the hostess. Wearing smart uniforms, with caps resembling those of military pilots, these young hostesses are chosen from the ranks of American nurses, and approximately 200 of them are in service on the American air lines. Each hostess has a buffet at the rear of the saloon, from which she serves sandwiches, coffee, cigarettes and other refreshments. On these American air liners such refreshments are served without charge, and the hostess is busy throughout each flight

—CHAIRS BY DAY

Here are the same berths neatly converted into adjustable full-size chairs for daytime travel. In this form the F36 carries a maximum of 32 passengers for comparatively short but well-patronized routes, such as that from Amsterdam to London. The interior furnishing of aircraft is now a highly-specialized job

BERTHS BY NIGHT—

The Fokker F36, designed expressly for the Royal Dutch Air Lines' services, has two alternative accommodation schemes. Above, passengers using two of the sixteen berths provided for night-flying on the twice-weekly service to the East Indies. The "aerial sleeper" is already an accepted practice on certain American lines



flying at the very high speeds necessary if air transport between American cities is to show a sufficient time-saving over the competition of fast surface routes. These conditions have led to the production of such a world-famed air liner as the Douglas transport monoplane. This "flying hotel" type of machine, even when competing against racing planes, put up a splendid show in the England-Australia air race. The performance figures of this luxury air liner, when driven by a couple of 710 horse-power



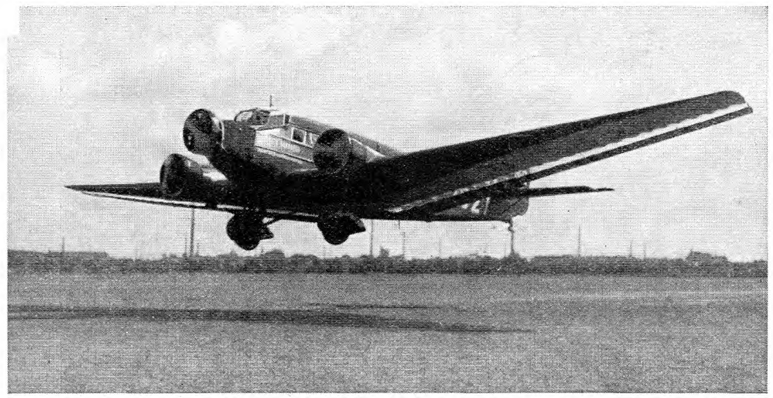
Keystone

WORK OF A DUTCH GENIUS

Ever since the World War the name of Anthony Fokker has always stood in the forefront of the world's designers. Today, Fokker commercial monoplanes are in universal use. The Fokker F36 (above) is a recent and typical design, having a high wing of wooden cantilever construction and a fuselage built up of steel tubes

providing her passengers with appetizing snacks from her buffet, together with cigarettes and a selection of newspapers and magazines.

There is another type of Douglas air liner, which carries 18 passengers; while on the main French air lines there are interesting developments in the use of high-speed air expresses of the luxury type. The Bloch 300, for example, provides a first-class cabin for eight passengers in the front of the machine. Then, behind this, there is a cocktail bar seating four people, and presided over by a uniformed steward, while in the rear of the machine there is a second-class saloon seating 16 passengers. This Bloch luxury plane, driven by three engines developing 1,000 horse-power each, is capable of a speed of 208 miles an hour. Another machine of a rather similar type, the Dewoitine D620, has two sumptuously equipped cabins seating 30 passengers. On the power of three motors, developing a total of 2,640 h.p., it attains a maximum speed of 217 miles an hour.



STANDARD GERMAN TRANSPORT

In contrast to the Fokker company's designs (see illustration at the top of the page), the equally famous Junkers works in Germany have always concentrated on the low-wing monoplane type, with metal skin covering. The German Air Lines (Deutsche Lufthansa) own a large fleet of the JU–52 14-passenger tri-motors, one of which class is seen in flight above. A military version is illustrated in pages 180–1

Transport air liners of the American Douglas type are now provided in which day-flying accommodation for 24 passengers can, at night-time, be transformed into comfortable sleeping berths for 16 passengers. Large luxury planes which fly regularly at night, having their sleeping berths made up by the stewards just like those of a long-distance train, are coming into service in increasing numbers on the world's main air lines. A machine such as the big four-engined Fokker express, the F.XXXVI, now used on European air lines, provides armchairs for 32 passengers by day and sleeping berths for 16 at night. Ingenious devices are employed in this machine to lessen noise and vibration in the cabins.

War in the Air. 22

THE CAULDRON OF THE HEAVENS

By Capt. J. B. Sterndale Bennett, M.C.

During the great German attacks of March and April, 1918, the Flying Corps played its part nobly in supporting the harassed and retreating British infantry. Not the least notable exploits of the airmen during the last year of the War were the bombing raids on German industrial centres by the Independent Force

THE British High Command owed much of its awareness of the impending attack of the Germans in March, 1918, to the preliminary reconnaissances of the Royal Flying Corps. Although greatly hampered by the weather, both before and during the battle, pilots with their observers patrolled whenever possible, noting the fresh concentrations of troops and the increased activity on the railways. Trains steaming towards the railheads after daybreak indicated that the task of transportation had been so heavy that it could not be completed during the hours of darkness. Everywhere there were signs that the Germans were preparing for an attack of the first magnitude. That the blow was due to fall was well enough known; the hour of attack and its precise direction remained obscure.

The Flying Corps was instructed in the duties of its defensive rôle. These did not differ in substance from those which it normally carried out, for it was insisted that the best defence would result from a consistently offensive policy which aimed at attacking the enemy in the air whenever he was met with, either over his own lines or when attempting any act of aggression. The routine duties of the Corps squadrons—reconnaissance, photography, spotting for the artillery—were to be carried out with increasing vigour, and the most determined efforts made to bomb railways, rest billets, troops on the march, and aerodromes—indeed, any enemy target of importance.

Long before the battle opened, an immense amount of useful work was being done by the patrols. New dumps, new light railways, new aerodromes were spotted. The detection of a number of white objects on the ground led to the destruction by artillery fire of thousands of rounds of ammunition. Meantime, the German air force, although vastly increased during the past year, refrained from showing its strength, and had on occasion to be baited by bombing before it would show fight.

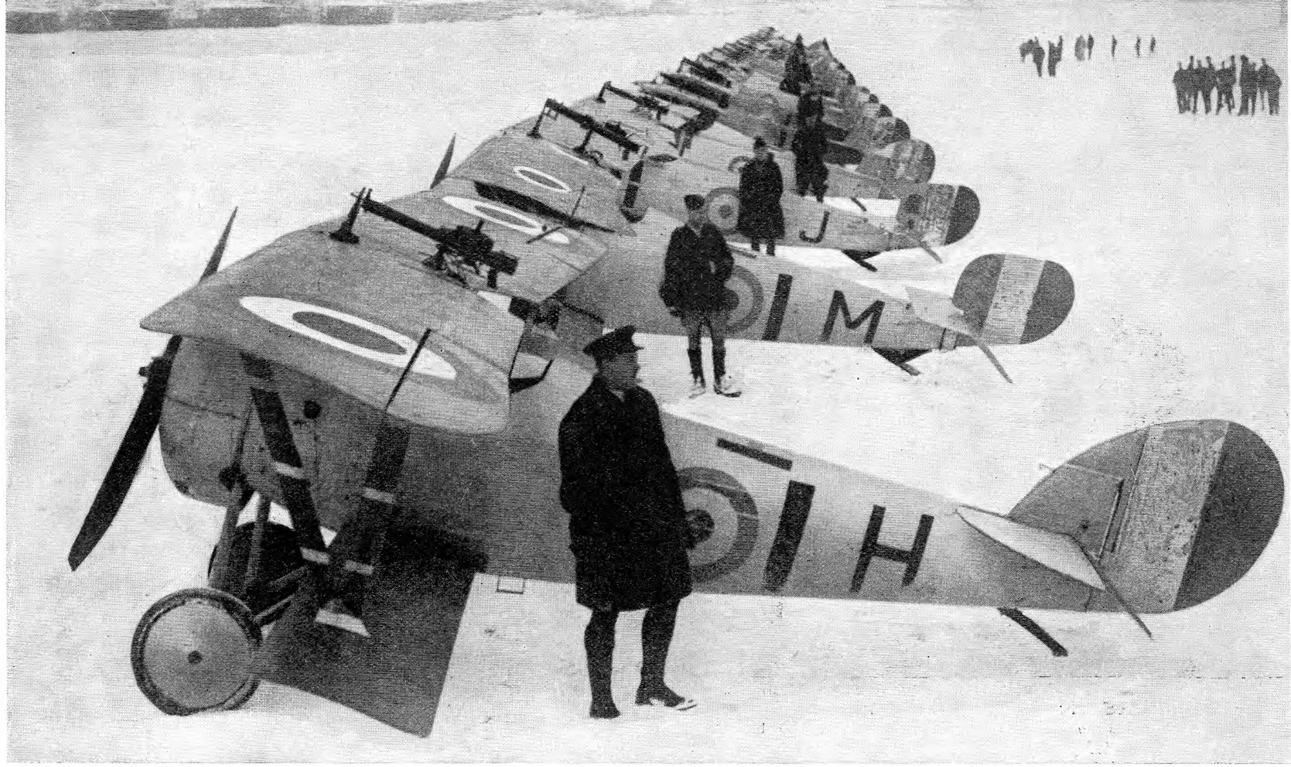
Such was partly the object of a large-scale bombing raid on March 17, directed against the aerodrome dump and station at Busigny. The bombing aeroplanes were followed by a formation of S.E.5's, which attacked the enemy aircraft as soon as the bombers had cleared off. The outcome was that three

COMRADES OF DEADLY COMBAT

During the closing months of the Great War air fighting reached its most intensive stage, and single-seater scout squadrons were constantly battling above the lines. Below, pilots of No. 85 Squadron are seen on St. Omer aerodrome with their S.E.5a's lined up behind them. This type of machine was one of the finest of the War period

Imperial War Museum

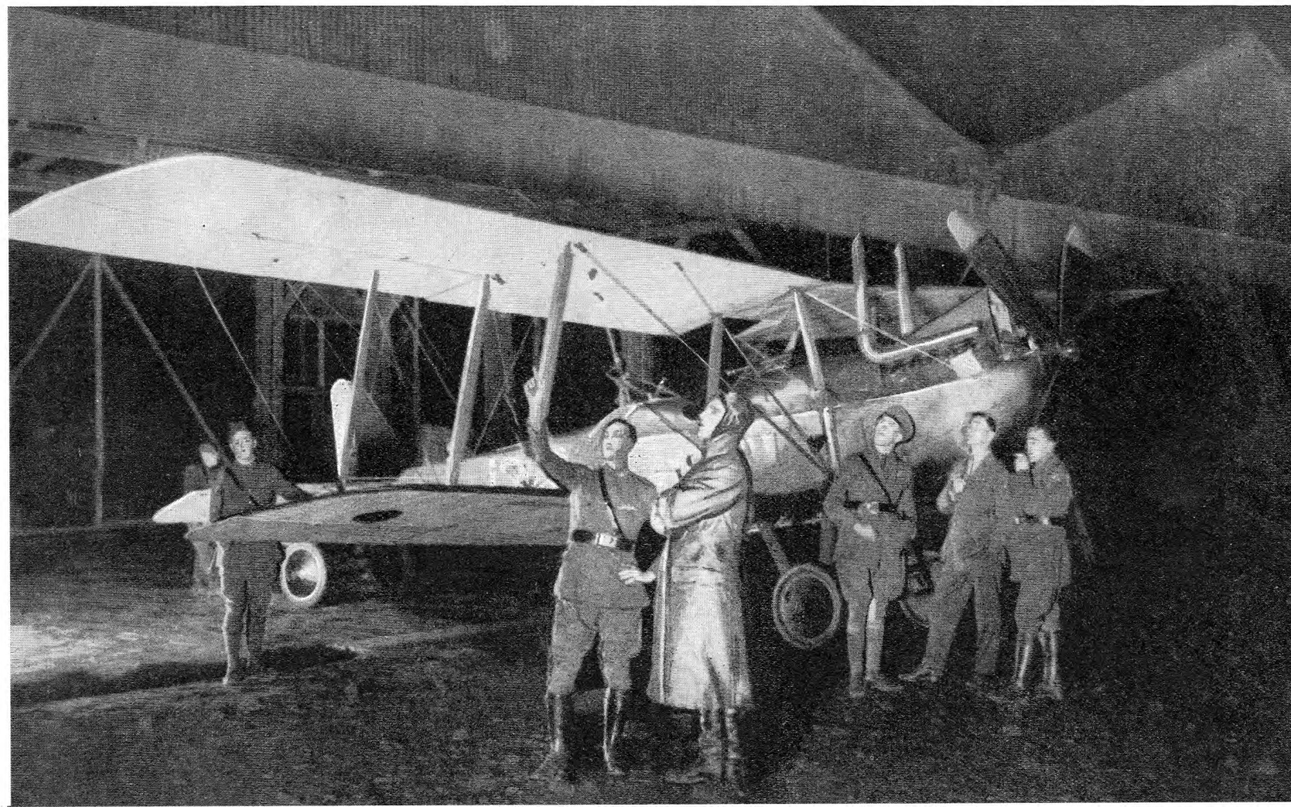




Imperial War Museum

CEASELESS TASKS OF BRITAIN'S AIRMEN

By day and by night, all the year round, the Royal Flying Corps carried on its duties with unabated zeal. These photographs show sharply contrasting scenes at war-time aerodromes. Above, Nieuport single-seater "Scouts" lined up in the snow at Bailleul in December, 1917, ready for a patrol over the lines. Below, a pilot of No. 69 Squadron of the Australian Flying Corps discusses his job with a fellow-officer before taking off from Savy on a night flight. His machine is an R.E.8 two-seater, a type used extensively for reconnaissance work in 1917–18





Photos: Imperial War Museum

BOMBERS IN ACTION

In this photograph, taken during an actual raid, a bomb from a British plane can be seen hurtling towards an objective thousands of feet below. To the left is a D.H.4 machine also taking part in the attack. The photograph was taken on March 24, 1918, over Bisseghem, near Courtrai

German aeroplanes were destroyed. A similar manoeuvre next day resulted in a terrific dog-fight, in which fifty German aeroplanes, including Richthofen's circus, took part.

On this occasion the score was in favour of the Germans, who inflicted twice the losses which they suffered. Richthofen was at the peak of his career at this time, but his red Fokker was not long to remain a familiar menace in the sky.

On the morning of March 21, when a tremendous weight of attack was launched against the British Fifth and Third Armies, the ground was shrouded in a thick mist. This powerful ally of the Germans prevented effective observation or action from the air, just as it bewildered the troops on the ground; only here and there on the vast battlefield was any observation possible. In the Lagnicourt region the progress of the attack was watched almost from the beginning, but it was midday or later before any general survey of the battlefield could be made. The news then conveyed to Corps headquarters was grim enough, as, unhappily, it was to remain for many subsequent days.

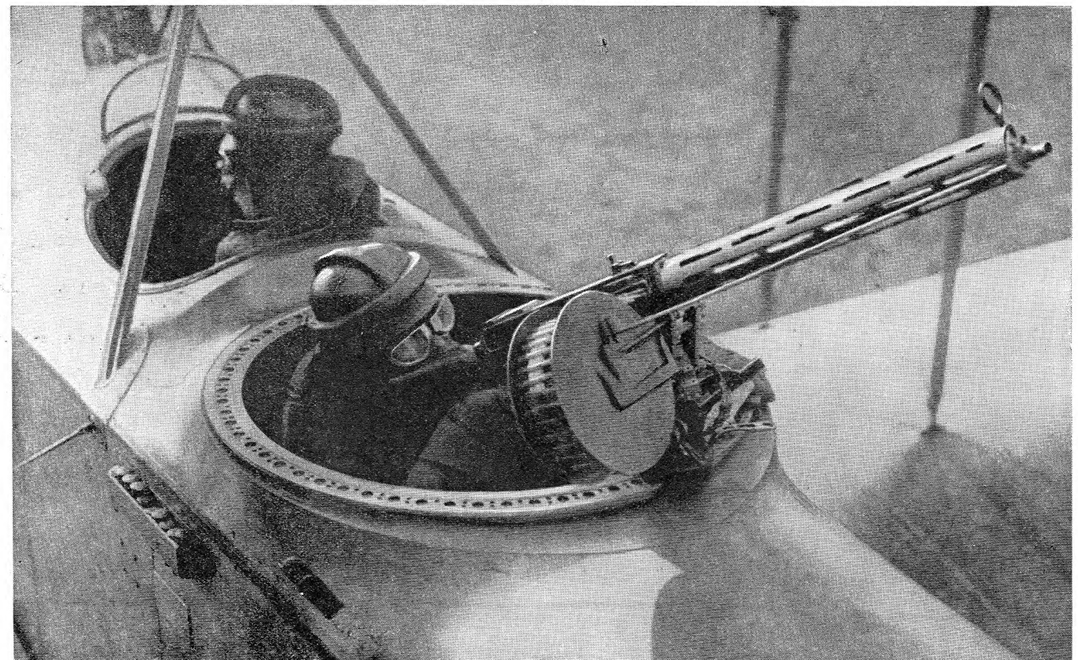
Nothing could stem the progress of the German attack, but throughout the battle the airmen were at times able to give the tired infantry some little respite by low-flying attacks on German troops advancing to the assault and by descending on German batteries and directing their machine-guns on their crews. In more than one German regimental history acknowledgement is made of the effectiveness of these attacks and the serious nature of the casualties inflicted, and the confusion which resulted is revealed. Wonder is expressed at the great daring of the British pilots, who attacked "regardless of consequences." These low-flying exploits were, indeed, extremely hazardous and the casualty list was very high, but the state of emergency made it necessary to continue them until March 31.

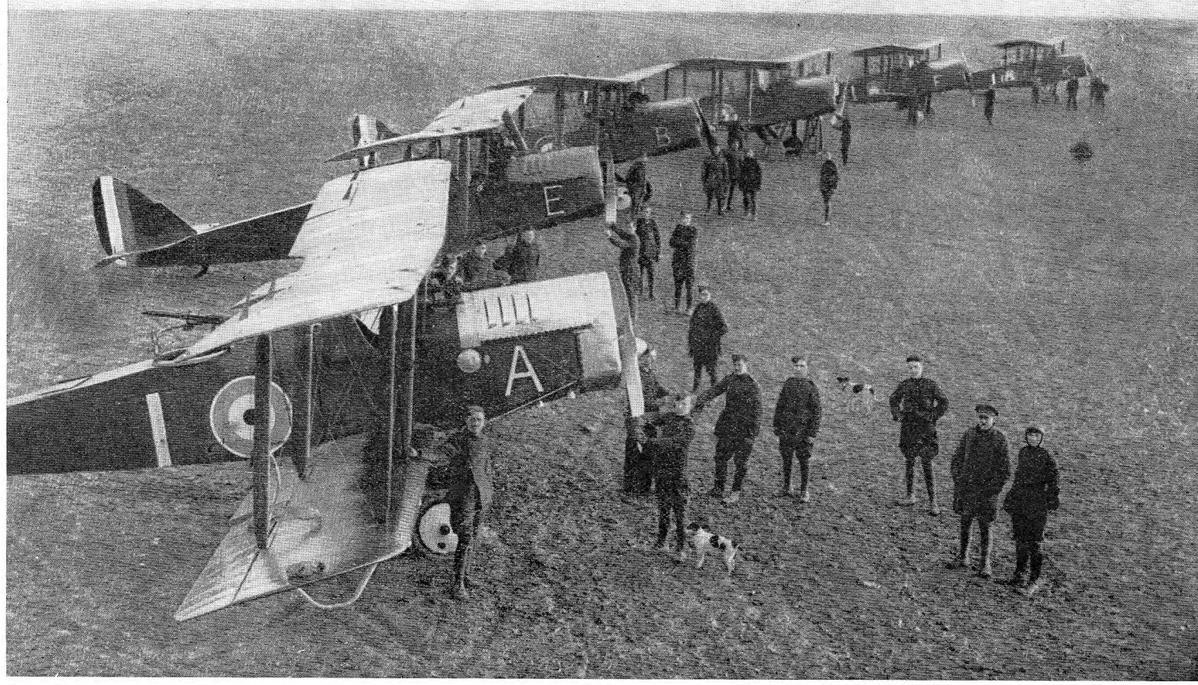
Throughout the period, fighting in the air was continuous. Thirty German aeroplanes were driven down on March 22, thirty-nine on March 23, and forty-two on March 24, but, on the whole, the German fighters inflicted greater casualties than they received. A typical example of a fighting patrol at this period is given by Mr. H. A. Jones in the Official History, "The War in the Air," under the date March 22. The squadron in question was No. 73; the patrol was eleven strong and set out in the early afternoon.

On the outward journey, near Ham, the leaders of the two Camel formations,

AT THE 'READY'

The development of aerial armament was marked in the last two years of the War, with the result that air combats became much more decisive and deadly. The photograph below shows a typical rear-gun arrangement on a German Albatros two-seater. The Parabellum gun is pivoted on a universally jointed support, the whole being rotatable on ring mounting that surrounds the gunner's cockpit





Photos: Imperial War Museum

FLIGHT OF 'FOURS'

The machines seen here are D.H.4's, two-seater day bombers which were first produced in 1917. Used extensively during the closing months of the conflict, they did valuable work with the Independent Air Force. This photograph was taken at Verny aerodrome in February, 1918

Captains A. H. Orlebar and J. S. Sharpe, led their pilots in a dive on a large German formation, and each leader shot down one Albatros, both of which were seen to crash—one in flames. Half an hour later the Camels, north-west of St. Quentin, attacked a formation of eight Albatros fighters, which were shortly joined by twenty others. In a brief, intense fight one Albatros was destroyed and others driven down. The Camels, without loss, re-formed and went on to Roisel, where five two-seaters were found and attacked and two of them destroyed. Captain Orlebar received a bullet in the leg, but this was the only casualty among the Camel pilots, who returned to their aerodrome with a record of six German fighters destroyed.

After the War Captain Orlebar commanded the British team for the Schneider Trophy in 1929 and 1931, and during these years held the world's speed record of 357·7 m.p.h.

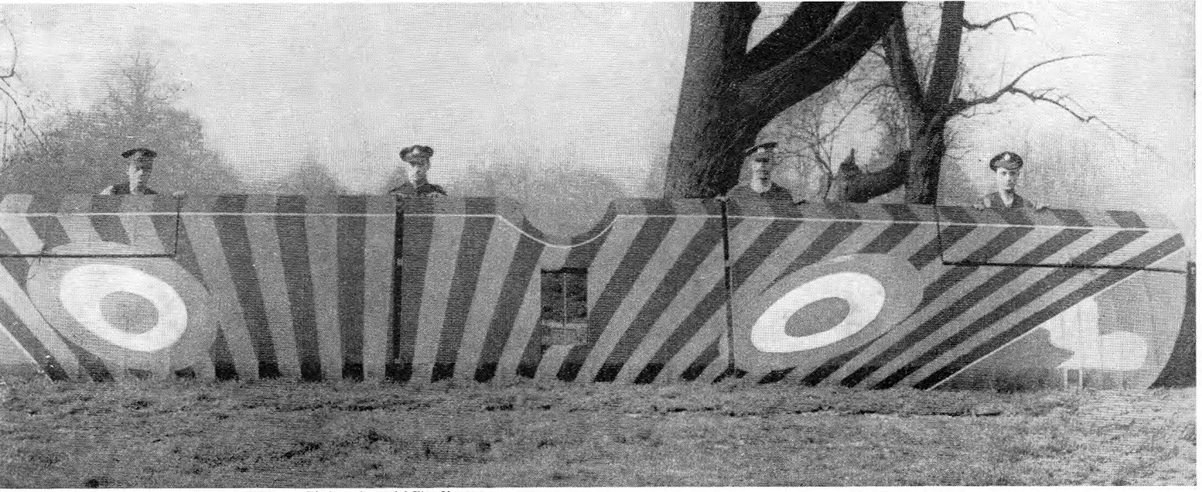
Nothing could exceed the devotion of the contact patrols which daily, and in spite of considerable opposition from the enemy, surveyed the progress of the battle from both sides of the line. They reported cases in which bridges had been blown up by the British in retreat, they reported at what points they had noted the movements of German reinforcements, they directed the guns on to likely targets, and they watched from day to day the receding fortunes of their own infantry.

It is a curious feature of this battle, when the rôle of the infantry was one of continuous and heartbreaking retreat, that the Flying Corps was able to maintain so much offensive spirit. The constant harassing of troops and batteries in the forward areas was supplemented by the work of the day and night bombing squadrons, which, in the face of incredible risks, made every German railway journey to the front a matter of apprehension and caused irreparable damage to German aerodromes, to ammunition dumps and other centres of supply. The Flying Corps, on its own account, could not stop the relentless advance of the German army, but it undoubtedly

BATTLE PREPARATIONS

Every squadron during the War had its "gun hut" where aircraft armament was serviced and overhauled. Below, two observers are seen drawing their Lewis guns preparatory to an early morning patrol from the aerodrome at Verny, in February, 1918. The gunnery officer on the left is making a last-minute inspection before handing over the weapons





Photos: Imperial War Museum

DAZZLE-MARKED

Bizarre patterns of the kind seen painted on this Sopwith "Camel" wing were devised to confuse enemy airmen by giving a false perspective. In this way their aim was often rendered inaccurate. Camouflage designs were also carried out on the fuselages of aircraft for the same purpose

played a significant part in reaching that position of stalemate at the end of March when Ludendorff decided that resistance in this sector was too strong to justify the continuance of his costly offensive.

Individual deeds of valour and skilful manoeuvre were numerous during the period. On March 24, Captain J. L. Trollope of No. 43 ("Camel") Squadron created a record by shooting down six German aeroplanes in one day—three in the morning and three in the afternoon. This achievement was equalled not long afterwards by Captain H. W. Woolett of the same squadron, near Estaires, during the battle of the Lys on April 12, and, as has already been related, it was repeated by the great French airman, René Fonck, in May of the same year.

An air V.C. of the time was won by a Canadian, Second-Lieutenant A. A. McLeod. He was on his way with his observer, Lieutenant A. W. Hammond, M.C., to attack German infantry east of Albert and, fighting his way through hostile formations, was suddenly attacked by eight enemy triplanes, which dived at him from all directions, firing from their front guns. The official account of his heroic performance continues:

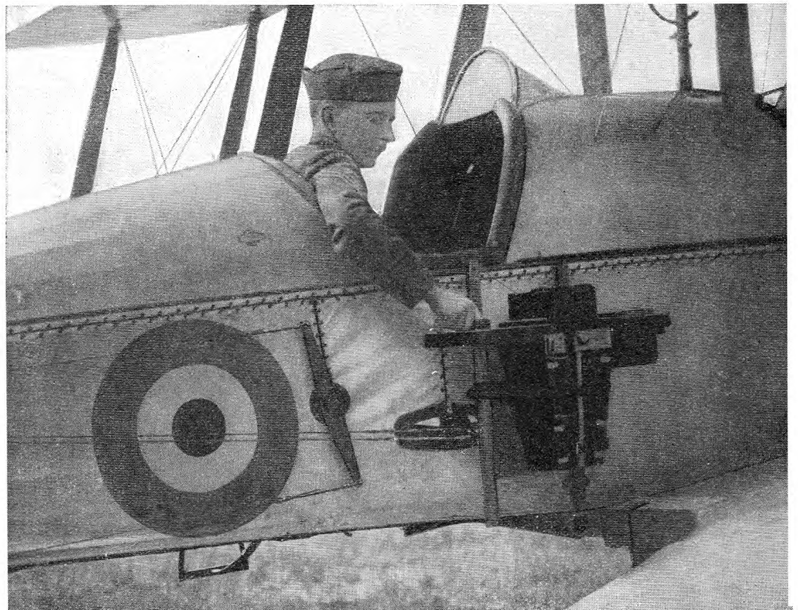
By skilful manoeuvring he enabled his observer to fire bursts at each machine in turn, shooting three of them down out of control. By this time Lieutenant McLeod had received five wounds, and whilst continuing the engagement a bullet penetrated his petrol tank and set the machine on fire. He then climbed out on to the left bottom plane, controlling his machine from the side of the fuselage, and by side slipping steeply kept the flames to one side, thus enabling the observer to continue firing until the ground was reached. The observer had been wounded six times, when the machine crashed in "No Man's Land," and Second-Lieutenant McLeod, notwithstanding his own wounds, dragged him away from the burning wreckage at great personal risk from heavy machine-gun fire from the enemy's lines. This very gallant pilot was again wounded by a bomb whilst engaged in this act of rescue, but he persevered until he had placed Lieutenant Hammond in comparative safety, before falling himself from exhaustion and loss of blood.

Before passing on to the next great conflict of April, 1918, one further word must be said of an exceptional difficulty which had to be met by the Flying Corps during the March, 1918, retreat. This was the provision of aerodromes and supply depôts to take the place of those captured by the Germans during their rapid advance. The problem was tackled from day to day with exceptional energy, and it is doubtful whether the necessity for a constant change of landing ground or headquarters ever seriously impaired the efficiency of the Flying Corps during the whole of the battle.

When, towards the end of March, Ludendorff decided that his Amiens attack must be abandoned, it was not long before British aerial observers detected the nature of his new ambitions. These took the form of a mass attack between La Bassée and Armentières, directed first against the line weakly held by the Portuguese and aiming ultimately at the Channel ports. The work of the Flying Corps differed little from that undertaken during March. The same disability of fog had to be faced, the same low-flying expeditions in support of the infantry had to be

TELL-TALE OF THE SKY

In common with every other branch of military aviation, aerial photography developed in an astonishing manner during the Great War. At first, photographs were taken with hand cameras, but later cameras fixed to the fuselage side, as seen here, were adopted. An ingenious mechanism changed the plates automatically. The aeroplane is a B.E.2c

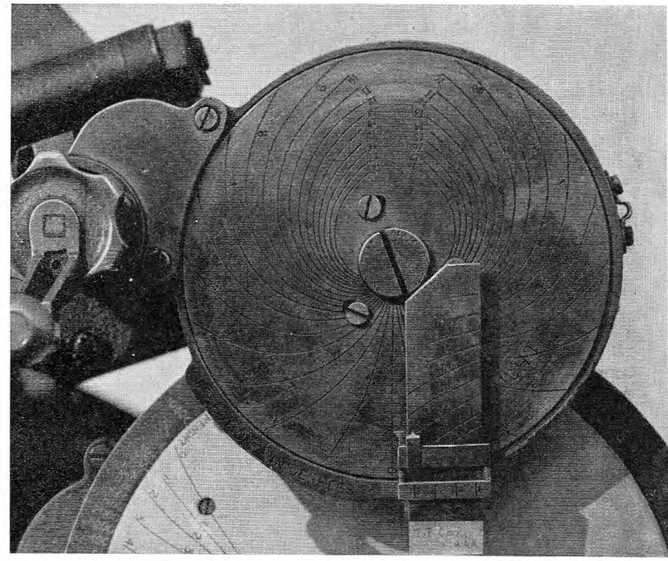


undertaken, and it is a remarkable tribute to the airmen that on the very day, April 12, that Sir Douglas Haig issued his "backs to the wall" message, it is officially recorded that "more hours were flown, more bombs dropped and more photographs taken than on any day since the War began."

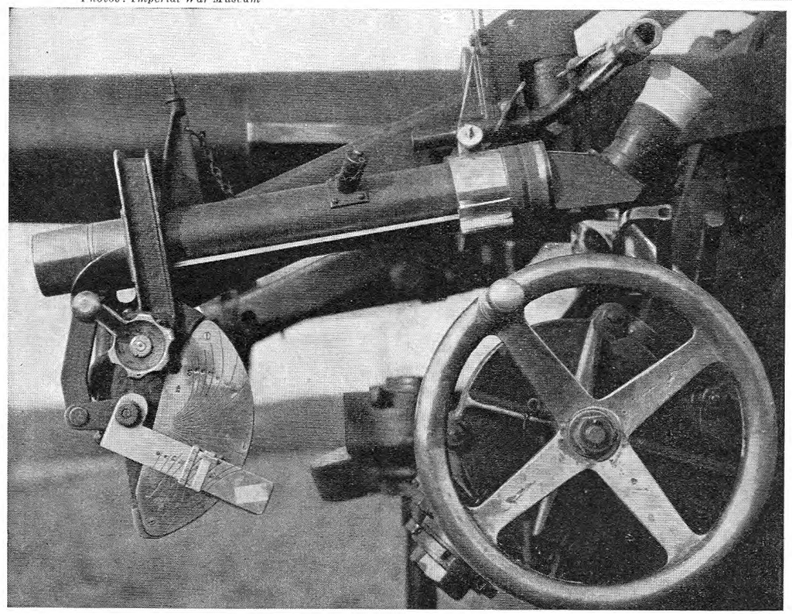
During the period under review considerable growth took place in another important sphere of the Flying Corps' activities, the long-distance bombing raids into German territory. As early as October, 1917, the nucleus of an Independent Force, entrusted with this duty, had been formed near Nancy under Lieutenant-Colonel E. L. N. Newall. This was composed of "A" Naval Squadron and Nos. 55 and 100 Squadrons R.F.C., and grew in both power and performance. In the following year, it was taken over by Major-General Sir Hugh Trenchard. Known as the Independent Force, Royal Air Force, it was responsible for an immense amount of destructive bombing on German industrial centres in the Saar, in Alsace-Lorraine and even farther afield. There is every indication, from both British and German sources, that these raids had a moral and material effect which can only be described as devastating.

While their victorious armies were marching towards Amiens, the Germans felt none too secure in some of their manufacturing towns. On March 24, for example, raids by the Independent Force were carried out on Thionville (Diedenhofen) station and on the railway lines between this town and Metz and between Metz and Luxemburg. An agent's report of this attack stated that in Metz-Sablon fifteen trucks caught fire at the station and seven munition wagons amongst them exploded, doing much damage to the tracks. Seven houses were badly damaged and a gasometer was struck and put out of action. Traffic was held up for hours.

The Germans attempted to organize an effective resistance to this new menance, and increased the number of their aerodromes and fighting machines opposite the Nancy squadrons. This, however, only served to increase the number of targets available to the Independent Force. To No. 100 Squadron was entrusted the task of bombing enemy aerodromes, and very thoroughly was it fulfilled. At Bolchen (Boulay), near Metz, the Germans had concentrated a large number of night-flying Gothas and Friedrichshafeners, and the aerodrome was the object of the most persistent attacks, No. 100 Squadron paying it no less than 25 visits. This aerodrome, however, was by no means the only one to receive attention. Freisdorf, ten miles north of Bolchen; Freccaty, near Metz; Buhl and Lorquin, near Saarburg; Morhange, near Saralben; and Nieuderum, near Falkenburg,



Photos: Imperial War Museum



'ARCHIE' CLOSE-UPS

All the belligerent countries employed anti-aircraft guns to combat raiding aeroplanes during the Great War, and pilots were frequently faced with intensive barrage from ground forces operating "A.A." batteries. The effective firing of these guns entailed highly accurate calculations, and intricate dials were incorporated for the purpose. Above, a lateral deflection dial on a gun, giving values for varying ranges and heights. Left, vertical deflection plate giving similar values

were all effectively attacked from time to time.

Nor did these comparatively near targets form the limit of penetration. Frankfurt, Cologne and Mannheim were objectives, and on the night of September 20, 1918, two Handley Pages dropped twenty-eight 110-lb. bombs on Karlsruhe and Mannheim. At Karlsruhe the wharves, the bridge connecting the wharves to the town, and the gasworks received direct hits. A third Handley Page made a successful attack on the steel works at Saarbrücken. The Independent Force continued its destructive work until the end of the War, playing a limited but decisive part during the final months.

Art and Craft of Airmanship. 9

WAR MACHINES v. COMMERCIAL MACHINES

By Lieut.-Col. J. T. C. Moore-Brabazon, M.C., M.P.

Herein Col. Moore-Brabazon, having emphasized the handicaps under which commercial flying has suffered through its close association with the military side, suggests certain developments which will, he thinks, put it on a sound basis and thus prepare for it a very prosperous future

THE whole history of flying is so short that it has scarcely had time to settle down into the different grooves that must inevitably be marked out. After all, it is a new system of transportation, and, consequently, one must view it today as something very young and something which wants constant looking after during its teething troubles to make it fill the niche in our world that it deserves.

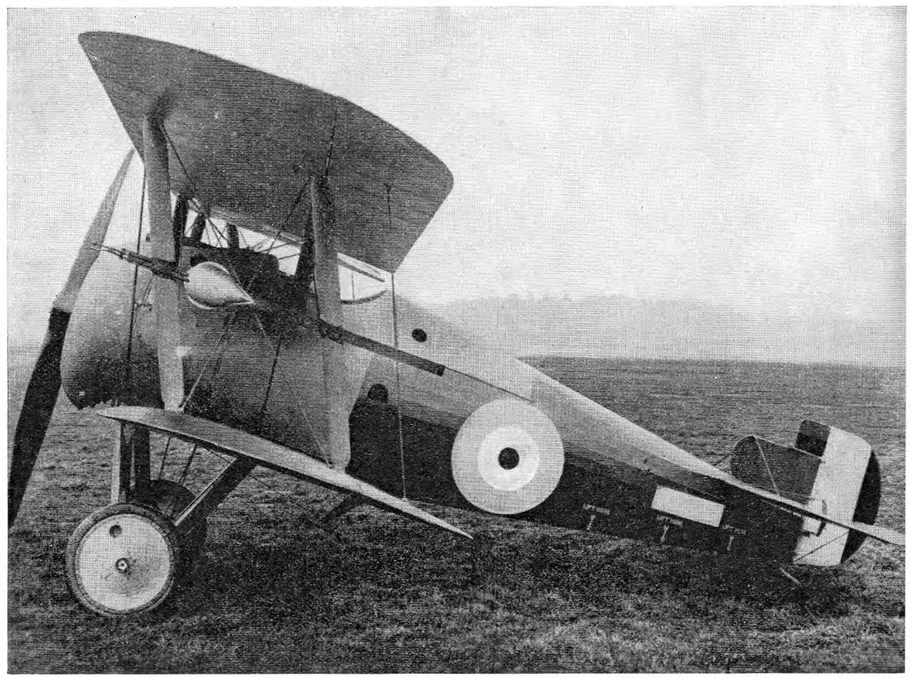
The advent of the War at a very early stage in the history of flight, from a prima facie point of view, appeared to have helped aviation by virtue of the enormous progress on the scientific and production side. Yet, on reflection, I very much doubt whether, on the commercial side, it did the whole movement any good.

What were the ambitions of the military? First of all, they wanted a machine to do the work of a scout; soon the scouting machine became vulnerable from the fighter, so protecting fighter machines had to be produced. Then, again, came the hard-working corps machine, taking photographs, spotting artillery fire, etc., from which much valuable information was culled. These machines became vulnerable from fighters, so that fighting squadrons had to cruise at 10,000 feet, while the corps machines did their job at about 6,000 feet. There followed the long-distance reconnaissance machine, and later, again, the long-distance bomber.

The struggle in the War was always to produce something a bit better than those the enemy possessed. Machine design was governed by military considerations — the firing of the machine-gun through the propeller, manoeuvrability, elimination of blind spots, quick climbing, etc. Such things were of vast importance to military machines, whereas cost of production and low rate of upkeep and cost of fuel were considerations that did not come into the problem at all. Quick production in large quantities was also essential from the war point of view, although such extreme rapidity is not in any way necessary in civil aviation. Consequently, at the end of the War in 1918, we had certainly advanced tremendously in some particulars, and certainly, from a purely scientific point of view, much valuable work had been carried out.

With regard to engines, some remarkable power units were being produced, but they were very expensive, very costly to keep in the air and did not last very long without complete overhaul. It was in these circumstances and under these conditions that, after the War, civil aviation tried to play its part in transportation.

Holt Thomas will always be remembered as a great pioneer in this respect, but nobody could make aviation, as it was at that date, a success. The high cost of machines, the enormous consumption of petrol and the small pay load made the whole thing impossible. Eventually the Government, realizing that aviation had an Empire value, stepped in to amalgamate certain companies which had survived, and, by virtue of subsidies, started a new organization to push the whole matter along, until such time as, in the words of Mr. Winston Churchill, "aviation could fly by itself."



Imperial War Museum

PERFORMANCE AT A PRICE

The Sopwith "Snipe" (above) was one of the last single-seater fighters to go into service during the Great War. In its design everything, including economy, had to be sacrificed to military performance. The engine, a B.R.2 rotary of 230 h.p. fitted with a large-diameter airscrew, consumed 21 gallons of petrol per hour. The "Snipe" was capable of 121 m.p.h. at 10,000 feet, which it could reach in 9½ minutes

In most countries subsidies were given by the Government through a department interested in the military side. The growth of civil aviation was really not the true desire of such offices, so much as the building up of potential war reserve, masquerading in peace time as civil aircraft.

There were two countries, I think, that were singularly guiltless in this mistaken policy—one was the United States and the other Great Britain. To see this development in its most accentuated light, one must follow what occurred in Germany, where all military machines were barred by the treaty of Versailles; but through subsidies from the Government, civil aircraft routes soon existed between every town, and transport was almost entirely carried out by military machines masquerading as commercial aircraft. In one instance I remember well it was claimed as an advantage that mails could be dropped through some particular trap-door whenever desirable! Why mails should be dropped from the air passes anybody's comprehension; were they substitutes for bombs?

We in Britain have been saddled with the great Air Ministry built up out of the War with all War traditions. It was a pity civil aviation was put into this ministry at all. If the motor-car had been invented during the War, on a similar basis all development in road transport would have come under the War Office. Mixing war with civil aviation in one ministry is a serious political mistake.



Charles E. Brown

BUILT FOR COMMERCE

The D.H. "Dragon" (above) has taken a leading part in making our internal air-lines an economic possibility. Carrying a pilot and anything up to ten passengers in a comfortable cabin, and using two "Gipsy Major" engines of only 130 h.p. each, it is practically as fast as the war-time "Snipe" (see previous page)

In the U.S.A., where long-distance journeys are imperative and where the weather is fairly well known, the development of civil aviation had an immense post-war boom. Many companies were floated; there was great competition to run one line against the other and to build up a network of commercial lines.

Technical competition became, of course, very acute, but when the slump came the American companies found themselves unable to pay dividends without very heavy subsidies. Technical development, however, had left its strong imprint upon civil aviation.

Through American enterprise the world had acquired a good deal of technically useful knowledge. First of all, pay loads of about twenty passengers were being dealt with. Speed had got up to 200 miles per hour, and three very useful technical improvements had been introduced. Though these are now well known throughout the world, we must give credit to America for introducing them.

These improvements were the flaps, which made these high-speed machines capable of landing on constricted aerodromes; the variable-pitch propeller, which enabled the machine to take off with heavy loads from the aerodrome, and, when it had obtained sufficient altitude, speeded it up tremendously; the third was the retractable undercarriage.

CONVERTED 'DRAGONS'

An economical machine like the "Dragon," converted for light military purposes, appeals to the air forces of the smaller countries, for which the latest fighters and bombers mean too heavy an outlay. The photograph below shows a fleet of "Dragons" ready for delivery to the Iraq Air Force. Note the rear gunner's cockpit and the redesigned tail

L.N.A.



All these technical improvements, of course, are now included in any machine which ventures on any hazardous commercial enterprise of transportation by air, but it is doubtful whether such machines even now, with their present high efficiency, can pay unless helped by some artificial advantage such as payment for carrying of mails, etc.

For some years according to the existing arrangements, there will be special payment for carrying mails, but it is essential to look upon commercial aviation today as something robbed of its romance and marvels, and as a method of transport that will have to fight its battle out with train, motor-car and shipping. Only when it can win by virtue of low cost in transport—a cost which may be proportionally higher than the ordinary rates by virtue of its enormous speed—will it have a self-supporting future, and a rosy one.

It is noteworthy that the very latest high-speed commercial machines have outrivalled the military long-range bombers. They have even obtained higher speeds than the fighters of most countries, with the result that no longer is it necessary to arm a bomber against a fighter, because a bomber today has the legs of the fighter. This may not always be the case, but it is so at the present time.

There is one particular point which wants serious attention, and that is the prime mover. Flight is the child of the internal combustion engine, but nobody can seriously say that the internal combustion engine of the petrol type is a sound power unit for aircraft, in view of the fact that it is carrying about with it quantities of probably the most dangerous fuel that exists.

Many accidents, which should only be trivial, turn too frequently into raging bonfires, and although it is sometimes said that it does not matter whether the dead bodies of the occupants of civil machines are burned or not, it is not true that in every accident people are killed.

No, petrol engines must be changed in commercial aircraft. Petrol engines have a superior claim from the point of view of efficiency, and for that reason will remain, I think, for many years the engine for military aircraft; but for long-distance commercial aviation the Diesel engine is long overdue. The fuel it carries is non-inflammable, it is less expensive, and the consumption is in the neighbourhood of only 60 per cent of that of the petrol engine power for power. It is essential to get aviation paying, and all efforts must be employed to this end.

Ground organization, I maintain, should be a national charge for some years to come. Comfort must be studied; noise, draught and smell must be eliminated if people are to be willing to pay their fares for this method of transport, and, as far as possible, the cabins containing the passengers must be kept at a constant pressure during the flight.

Already I have noticed passengers, transported from places like Basel to London, being taken up quickly to 12,000 feet and later brought down from that height quickly at their destination. A difference of twelve inches in the barometer, quickly indulged in, is not the sort of treatment that the normal citizen's constitution can stand. Problems of this kind have got to be studied.

From the British Empire point of view we have a greater difficulty than most countries. It is our duty to link up our vast possessions by lines of commercial aircraft, these lines running through many countries. The whole organization is difficult and expensive. At present it is in the hands of Imperial Airways, helped by the Government. There are, however, many routes which it is the function of shipping companies to take on. Railways got into trouble because they forgot road transport; shipping companies will get into the same position if they forget air transport. The cream of its high paying passengers will soon demand aircraft transportation. Shipping companies must see to it that they are in a position to provide this.

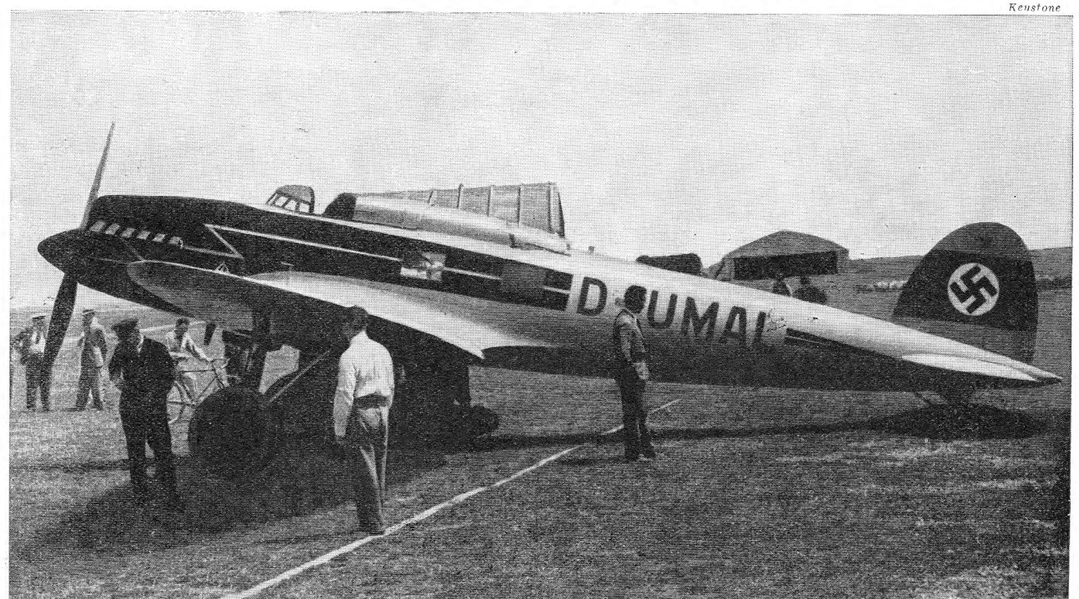
From the Empire point of view the future lies largely in flying over sea. Big four-engined Diesel flying boats are long overdue. The next few years will see them, but they will be a success only if military aviation as a subject is forgotten and left to the military mind, and concentration is indulged in on low cost of production, low running cost and on comfort and safety.

It is undeniable that in no other country is the advent of this type of machine more wanted than in Britain. I hope the next few years will make the powers that be, and the ordinary citizen with money to invest, realize to the full the possibilities that lie waiting to be developed.

FOR CIVIL OR MILITARY WORK?

The design of the Heinkel HE70, the original commercial version of which is illustrated in page 173, makes it eminently suited for high-speed bombing, and in this form it has been adopted by the new German Air Force. This photograph, taken at Bucharest, shows a military Heinkel, alleged to be en route for Abyssinia, which was forced down by the Rumanian authorities

Keystone





V.C. VICTOR OVER FIFTY FOES

During the Great War, 19 members of the British flying services gained the Victoria Cross for gallantry in the air. Last but one to receive this supreme award was Captain A. W. Beauchamp-Proctor, a South African who by his indomitable spirit and masterly flying accounted for over 54 foes. In addition to the V.C. he also held the D.S.O., M.C. and D.F.C., and when he was killed in a crash in 1921 the R.A.F. lost one of its most brilliant and courageous officers

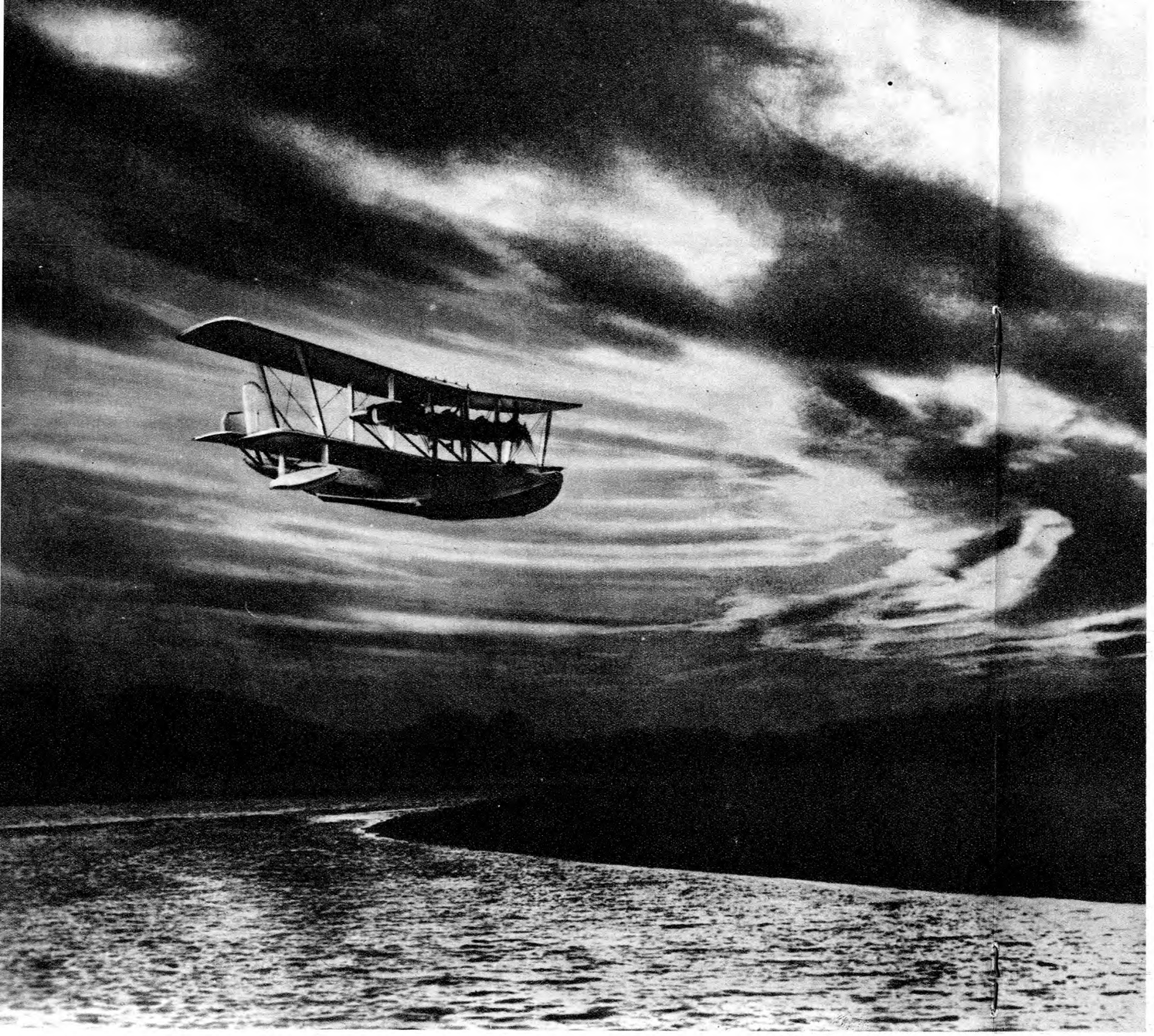
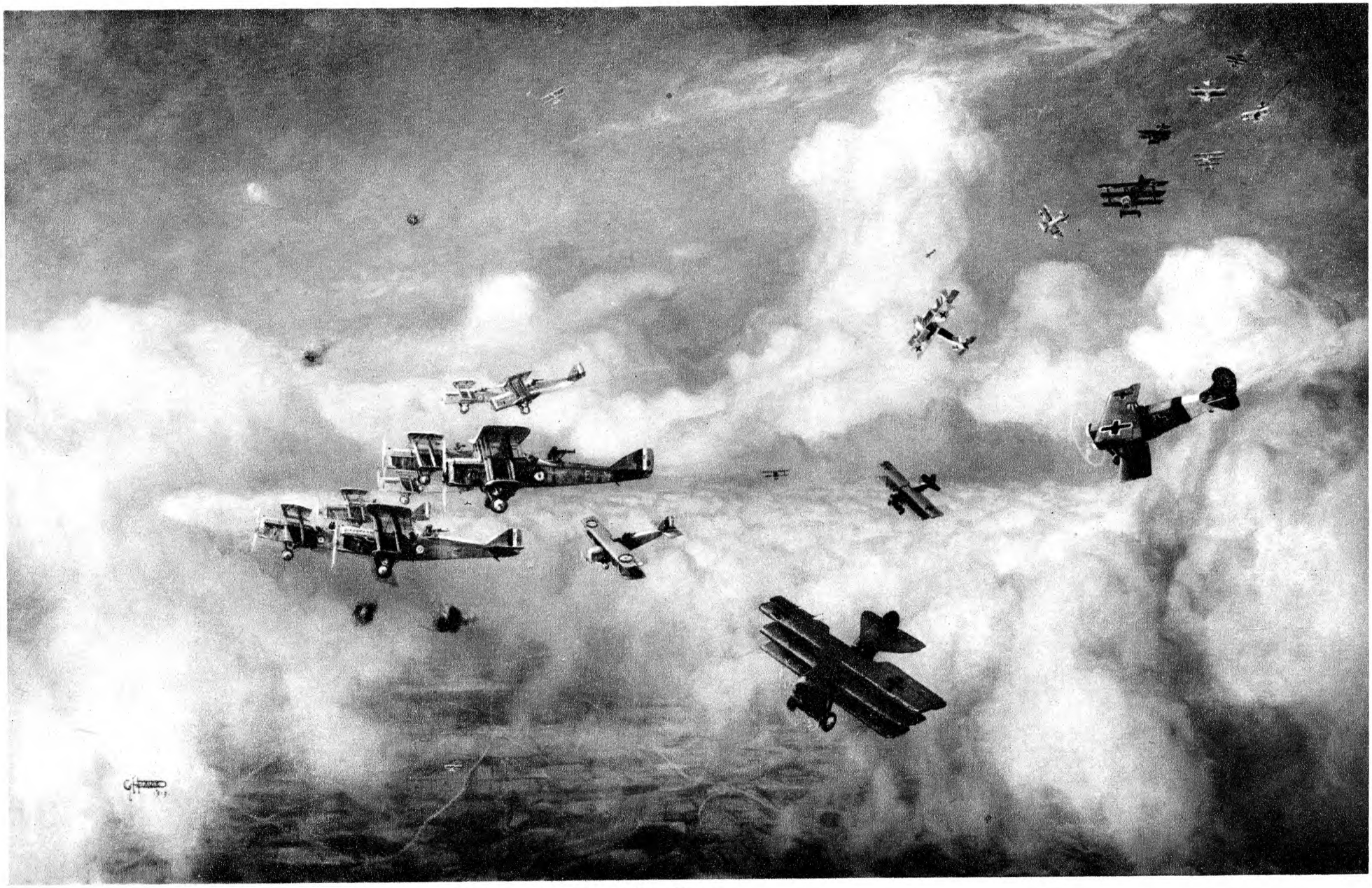




Photo (right): A. W. Hobart

CARRIERS OF THE ROYAL AIR MAIL IN STORM AND SUN

These fine photographs show two differing classes of four-engined liner which carry passengers, mails and freight for our national air transport company, Imperial Airways. On the left, a " Scipio " class 15-passenger flying boat, as used over the Mediterranean section, approaching harbour at sunset against a stormy background: and on the right the " Hannibal," first of the Eastern model H.P. 42's to be delivered. This class is used from Egypt to India and Kenya. It will be realized that the aircraft and crews on the Empire routes are run on a relay system



BOMBERS AT BAY

Copyright: Imperial War Museum

The long-distance raids carried out by the Independent Force in 1918 were fraught with tremendous hazards, for the heavily-laden British machines were constantly attacked by the high-speed single-seaters of the enemy all along their route. In this painting in the Imperial War Museum by G. H. Davis, D.H.9a's are seen in deadly combat with Fokker triplanes and biplanes. While the gunners endeavour to ward off the attack by intensive fire, the pilots bring their craft close together and fly on through a hail of bullets

World's Wonder Planes. 15

'FLYING FLEAS' & OTHER SMALL MACHINES

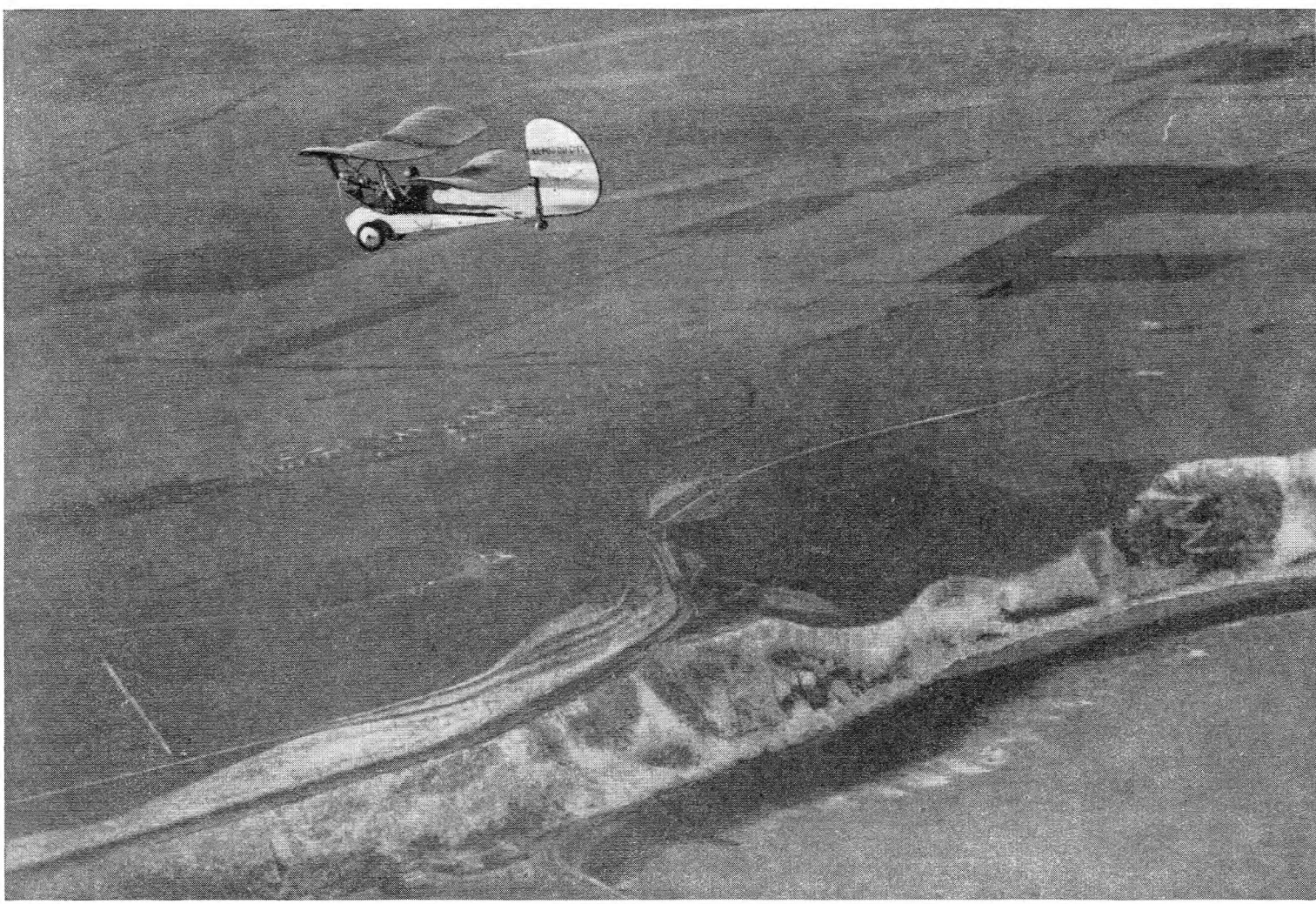
By Major C. C. Turner

The description of the Flying Flea given by Major Turner will be a powerful incentive to persons of moderate means who wish to take up flying as a pastime. Of French origin, it is the best known of the light aeroplanes, some of which only cost about twopence a mile to fly

VERY soon after flying became practicable, its progress characterized by a steady increase in the power employed, there was a reaction against high-power flight, and some experts pointed out that whereas with sufficient power a tea-tray could fly, and that much increase of speed could be extravagantly obtained by piling up the engine power, the real efficiency of a flying machine was shown by the small demand it made upon power.

The reaction did not have much practical result until after the War. Previously to that catastrophe the power advocates had it all their own way, for the urge was ever towards increased speed and climb. Nevertheless, in those early days a large number of aeroplanes had engines of less than 50 h.p. Blériot flew the Channel with an Anzani 25 h.p. engine, which yielded no more than about 18½ h.p. Still, there was an undercurrent of enthusiasm for low-power cheap flying, even man-power flying! It must be remembered that the engine and its supplies make up the most expensive item in the outfit, and that if flying were ever to become an inexpensive pastime something had to be done to bring down the first cost of the complete machine.

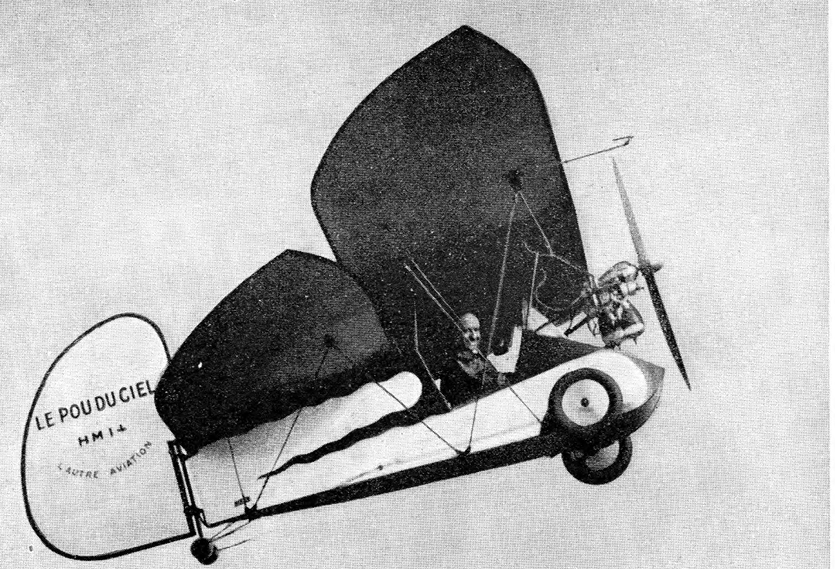
Low-power flying in Great Britain obtained its first important urge from the competition at Lympne, in 1923, for what were erroneously called power

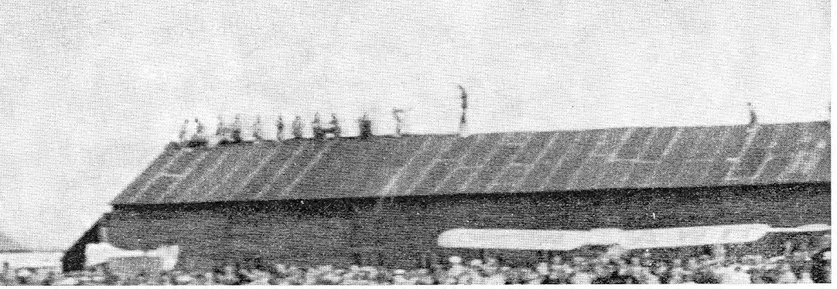


Keystone

FOLLOWING IN BLERIOT'S FOOTSTEPS

When Blériot made the first epic flight across the Channel in 1909 (see pages 5–7), few realized the tremendous significance of this feat. Twenty-six years after, another French pioneer, Henri Mignet, crossed the Channel in his "Pou-du-Ciel" to spread his gospel of the ultra-light plane among air-minded Englishmen. The tiny size of the "Pou" is well shown in this photograph, taken as Mignet crossed the white cliffs of Kent





Wide World Photos

SMILING PIONEER

At Shoreham aerodrome, in Sussex, Mignet gave the first public demonstrations in England of his "Flying Flea," in which he had crossed the Channel. Thousands of spectators watched the flights, including the photographer who secured the remarkable picture of man and machine reproduced above

gliders, a term colloquially derived from the glider competition at Itford Hill in Sussex. The first thought of many who engaged in that glider meeting was, "This does not lead us far. Let's put motor-bike engines in them and see where that will take us." This was done, or, rather, machines were designed for motor-bike engines, and the meeting at Lympne included a competition to decide which could fly the greatest distance on one gallon.

Nothing much came of that, and the meeting was followed by a light aeroplane competition, which brought out machines fitted with more power, and proved the incentive to the production in Great Britain of the Moth series, and of other types, fitted with engines of from 20 to 80 h.p.

History repeated itself again, and under the urge of the desire for more speed and better all-round performance the power put into so-called light aeroplanes steadily increased. Indeed, when the Fédération Aéronautique Internationale established categories of light aeroplanes for record purposes there was no limitation as to power, but only classification in respect of all-on weight. Light aeroplanes now usually have engines more than twice as powerful as the famous 50 h.p. Gnome, which 25 years ago was near the maximum.

From time to time there have been rumours of light aeroplanes fitted with very small engines, but not until M. Henri Mignet made his Pou du Ciel, politely translated Flying Flea, did the really low-power aeroplane become an established class. He had been working on the idea for a long time, and when Flying Flea No. 4, which he began to build in August, 1933, flew in the following month, the world began to take notice.

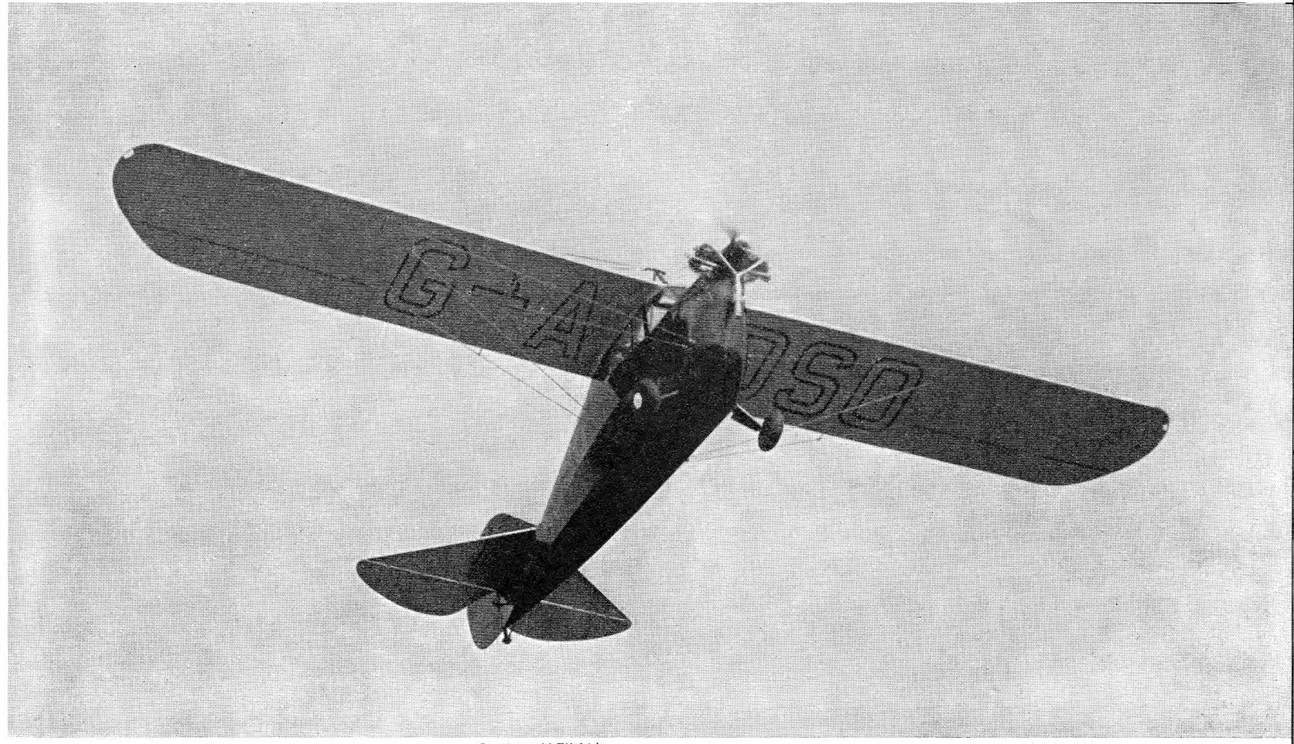
The Flying Flea was not only a low-powered, home-made aeroplane, it was an entirely new type, breaking away from established practice in many ways. The story of its development is charmingly told in M. Mignet's own book.

'FLEA' HANDLING

Below, Mignet demonstrates how easy it is to manhandle his "Flying Flea" on the aerodrome. This photograph shows very clearly the peculiar tandem wing arrangement, and also the simple 20 h.p. inverted twin Aubier-et-Dunne two-stroke engine originally used by Mignet

Sport & General





Courtesy of 'Flight'

AMERICAN MIDGET

This little high-wing monoplane is known as the Aeronca, and is one of the most practical of low-powered two-seaters specially made for the private owner. Of American design, it is now made in Britain. Pilot and passenger are seated side by side in a comfortable cabin, and a top speed of 93 m.p.h. is possible with an engine rated at 36 h.p.

The cost of the home-made aeroplane, apart from labour and engine, is only 1,300 francs (about £20); and undoubtedly it flies, although it certainly does not look very much like a greyhound of the air. Suitable engines cost from £35 to £50.

M. Mignet simplified the controls, doing away with ailerons, and depending for lateral balance in turning upon the shape of the wings. The machine is a kind of tandem biplane, the rear wing's leading edge being just under the trailing edge of the front wing. The front wing is movable as a whole, its leading edge a pivot, and its upward and downward deflections constituting the elevator, for the longitudinal control of the machine. It is simplicity itself, for the pilot has only one control, and that by hand. The movements of the control stick right and left turn the machine, and its forward and back movements head the Flea upward or downward.

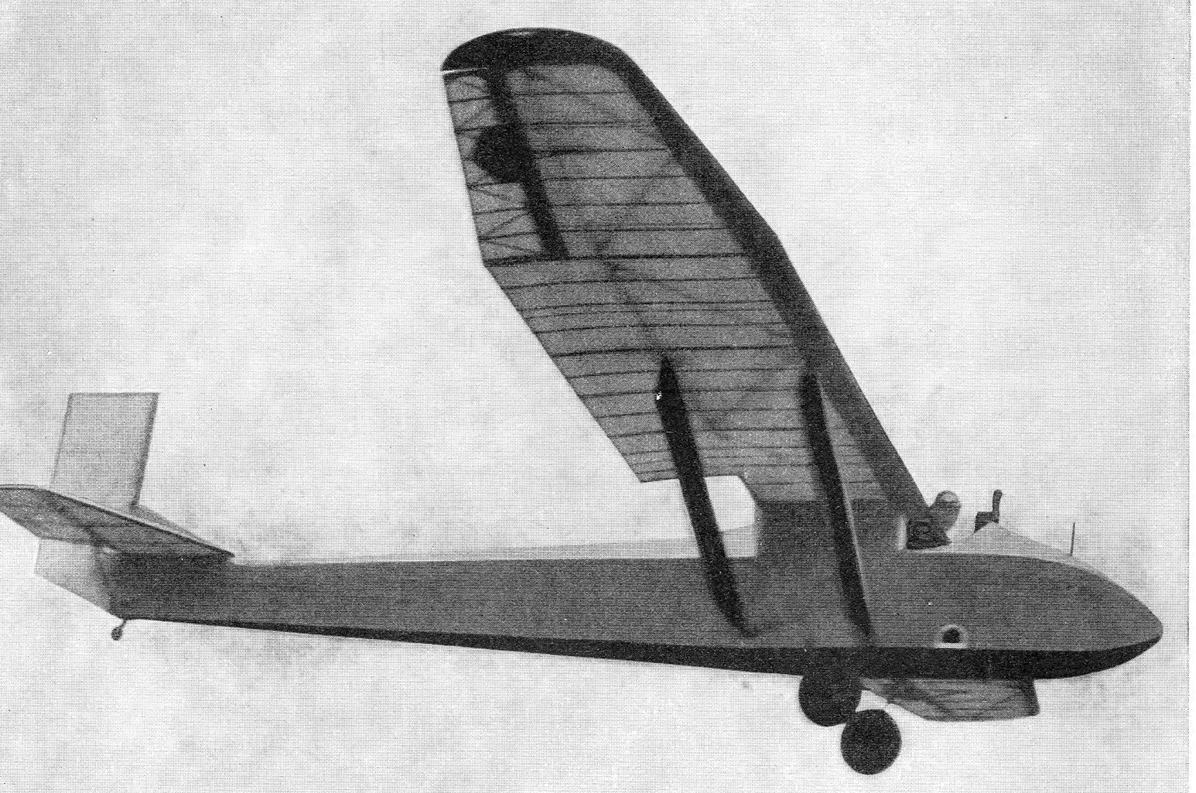
Obviously, there are risks in flying, no matter what care be taken in design and no matter how simple the control. There is nothing much amiss in the design and manufacture of motor-cars, but there are many accidents. In the case of the Flying Flea made at home there was at first no supervision, or rather no authoritative guidance, except that contained in M. Mignet's book of instructions. The Air League of the British Empire, however, took in hand the problem of standards of construction and arranged a system of inspection available to any amateur who desired guidance.

Nevertheless, several accidents occurred from one cause or another, but in some cases owing to the fact that the Flea's response to normal controls is somewhat surprising to pilots habituated to ordinary aeroplanes. Thus, when an aeroplane having the normal control system is tilted by a gust, say, right wing low, the pilot puts the stick over to the left in order to bring the right wing up again. This is usually sufficient to restore the machine to its normal position, though a very slight application of rudder may be necessary to compensate for aileron drag. If the Flea is tilted right wing low the same pilot would instinctively move the stick fairly smartly to the left, thereby applying a good deal of left rudder.

The first response of the Flea would be a sideslip to the right, with loss of height. Then the machine would begin to turn to the left, and then, and only then, would the right wing begin to accelerate and thereby gain lift and return to the horizontal position. In the meantime there would be a period of considerable danger during the sideslip if at a low altitude, and at the end of the manoeuvre the machine would be several degrees off its course. M. Mignet says, "The less you worry it, the better the Flea will fly"; and again, when speaking of flying in gusts, "The span of the wing sways; let it come back on its own."

It may be of interest to give the theory advanced by the Air League as to the causes of certain Flea accidents which occurred in France. These accidents apparently resulted from a stall, followed by an uncontrollable dive. The wing of the Flea is pivoted in front of the normal centre of pressure. During flight the pressure tends to raise the trailing edge, and the pilot counteracts this tendency by a constant pull on the control stick. But the tilt of the wing may become excessive, and the centre of pressure move forward and eventually pass beyond the front of the wing. Then the pilot, faced with a bad stall, is powerless unless he has the presence of mind to seize the trailing edge and force it up with his hand. Such an accident was very likely to occur with the earlier French-built machines, in which the pivot point was farther aft than is laid down in the British instruction books.

The introduction of the Flea and other low-price machines raised the question of government regulations, which were felt to be extremely hampering, requiring, as they did, inspection



Keystone

NIMBLE MINIATURE

Although of small power the B.A.C. "Drone," seen here in flight, has a good turn of speed and handles remarkably well. The engine is a horizontally-opposed twin-cylinder Douglas of 18 h.p. and drives a small pusher airscrew. The machine cruises at about 60 m.p.h., lands at 22 m.p.h., and its total running costs amount to no more than 2d. per mile

at every stage of manufacture, and certificates of airworthiness—in fact, a complicated procedure which had the effect of making flying expensive, and limited private flying to the well-to-do. After much agitation the Air Ministry was induced to yield concessions, but made third party insurance to a minimum of £5,000 compulsory. The cost of this is no more than about £7 10s. Permit to fly the Flea, and other such types, is obtainable free of charge from the Air Ministry. These machines, moreover, may be flown anywhere, except over populous areas and large crowds. Meanwhile, Flying Flea clubs have already been started at various centres.

The Flying Flea has been made in various sizes, with wing-spans from about 13 feet to 19½ feet. The engines fitted are mostly from 10 to 30 h.p., and their cost is anything between £30 and £60. Two or three other cheap aeroplanes, not of the home-made variety, call for attention. One of these is the Drone, first designed by Lowe-Wylde, but since then adopted and developed by the B.A.C., one of the directors of which company is Herr Robert Kronfeld, the famous glider. Herr Kronfeld has made many big flights on the Drone, on one occasion flying from London to Rotterdam, 216 miles, his petrol bill amounting to 5s.! Mr. Appleby, by the way, flew the Channel on the Flea he made himself, at a total cost of 1s. 5d.

The Drone is a parasol monoplane, with a span of 39 ft. 8 ins. It carries its engine, an 18 h.p. Douglas, on top of the wing. It is a very nice machine to fly, and the placing of the engine obviates what is an unpleasant feature to many people—namely, the engine and propeller in front.

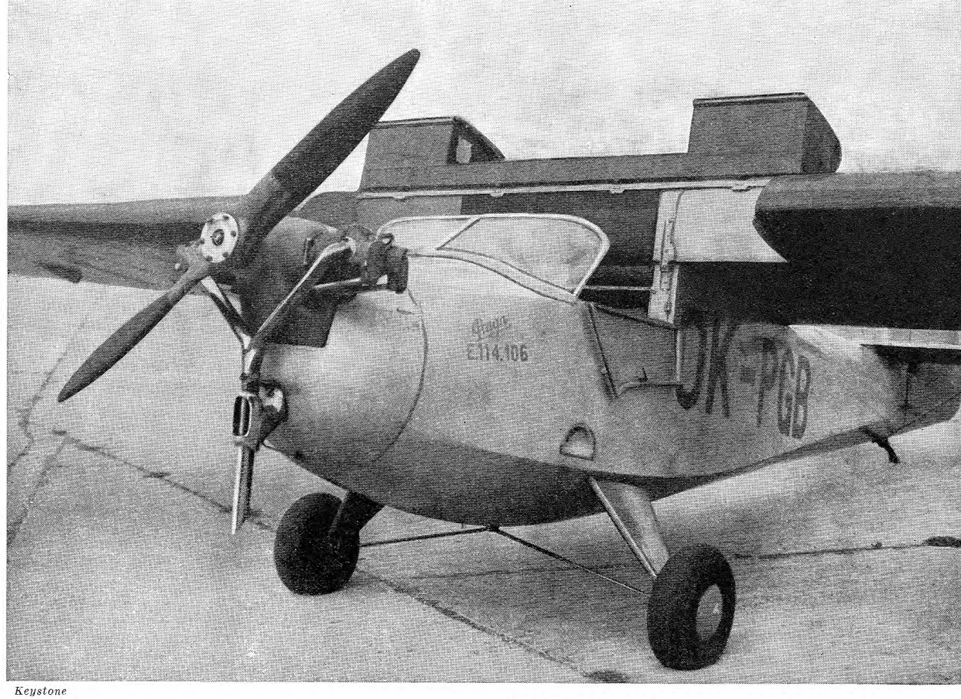
The design of the Drone is undoubtedly one of very great merit, the wing-loading being much less than that of the ordinary light aeroplane, and the landing speed, as a consequence, being very low, no more than 22 m.p.h., so that against a light breeze there is no difficulty at all. The machine does about 48 miles to the gallon, and it is claimed that the running costs, including depreciation and insurance, come to only 2d. a mile. It is easy to learn, and should, therefore, at the lowest estimate, be an economical introduction to flying, getting over most of the tuition at low cost and accustoming the pupil to the air. The type is winning the popularity it deserves, and there is little doubt that a great deal more will be heard of it during the next few years.



Wide World Photos

FEATURES OF AN AIR RUNABOUT

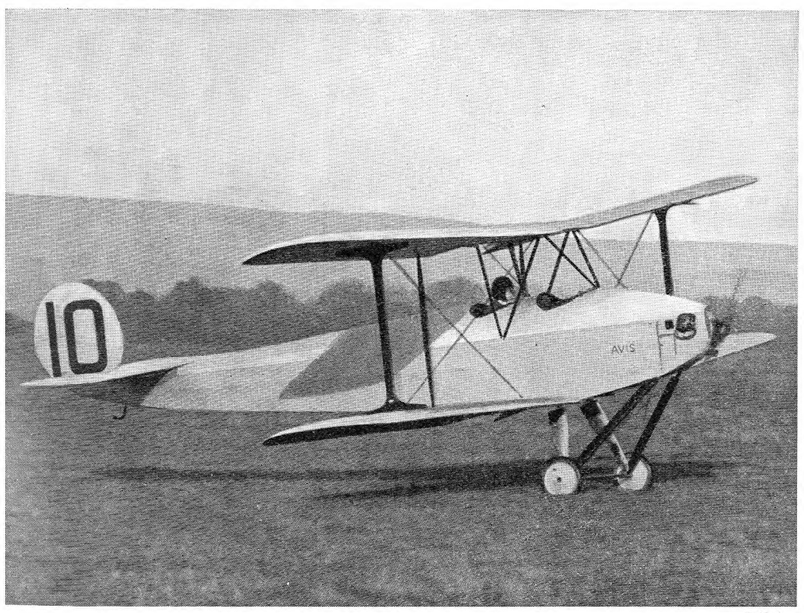
In this photograph the salient features of the B.A.C. "Drone" monoplane are clearly seen. The pilot's cockpit is situated immediately in front of the leading edge of the wing, on which is mounted the small air-cooled engine. Wood construction is embodied throughout and the whole machine is light yet strong. The span of the wing is 39 ft. 8 ins. The simple design of both the airframe and the engine make maintenance and repair work a simple matter



Keystone

'BABY' FROM THE CONTINENT

The Praga "Air Baby," hailing from Czechoslovakia, but to be built under licence in England, is another ultra-light plane of distinct promise. It is a simply constructed high-wing monoplane accommodating two persons side by side, and has a 40 h.p. flat-twin engine, also from the Praga factory. The ingenious hinged leading edge of the wing, to facilitate entry, is shown above, as is the wide-track divided undercarriage with balloon tyres, and the neat exhaust system



L.N.A.

FORERUNNER OF THE MODERN TYPE

In 1923–24 a number of interesting ultra-light aeroplanes were built experimentally and flown in a number of competitions. One of these was the Avro "Avis," a two-seater biplane powered with a 6 h.p. Douglas motor-cycle engine. It is seen taking off, the pilot being the late Bert Hinkler. This machine performed well, but its production was not continued owing to lack of a market for it

The Praga is a type of machine that can be used for dual-control instruction.

Much the same praise is due to the Aeronca, a two-seater built in England under licence from the Murray Aeronautical Corporation of Canada. This also is a high-wing monoplane, but is of normal design. It is fitted with a 36 h.p. engine and has a top speed of 93 m.p.h., and lands at 35 m.p.h. The Aeronca is a type of machine that can be used for dual-control instruction.

A type comparable with the Drone rather than with the Flying Flea is the Czechoslovakian Praga Baby high-wing monoplane, to be made in England under licence. This, also, is a two-seater, and has room for luggage. It cruises at 80 m.p.h., a remarkable result for a 40 h.p. engine.

In this machine, cabin roof and wind-screen are integral with part of the leading edge of the wing. The roof is easily opened and closed, and when open the cabin may be stepped into without the least trouble. It follows that the machine could easily be departed from with parachute in an emergency. Certainly, the Praga has a number of admirable features to recommend it to prospective buyers, and if the sale warrants it should be on the market at about £300.

Epic Flights of Famous Flyers. 13

THE FLIGHTS OF AMELIA EARHART.

By Grenville G. O. Manton

"Lady Lindy," as Miss Earhart has been called, began her flying career shortly after the Great War, and in 1928 as a passenger, she crossed the Atlantic. Four years later, in 1932, she piloted her own machine across the same ocean, landing in Ireland on making a twofold record. These flights and her triumphant crossing of the Pacific in 1935 are here described

FROM the very early days flying has held a strong attraction for women. In France there was a woman who flew as long ago as 1909, and her name, Baroness de Laroche, became famous throughout Europe. Her skill and daring were wonderful, for, let it be remembered, she was piloting machines when every flight was a gamble—a great and perilous adventure.

Others followed the baroness, and during the years 1910–13 quite a considerable number of women in France joined the ranks of the pioneers of flight. In England, too, feminine interest grew in the new art, and the aviation centres at Hendon and Brooklands were able to boast of women pilots. There was, for example, Mrs. Hilda Hewlett, whose certificate bore the number 122. She "took her ticket" in November, 1911, and gained so much experience that she ultimately taught her own son to fly.

In 1912–13 races were organized for women flyers, and something of a sensation was caused when an American, Miss Harriet Quimby, flew the English Channel on May 16, 1912, in a Blériot monoplane. Miss Quimby was the first American woman to hold a pilot's certificate, and she was one of the first women to venture across the sea alone in an aeroplane. Women were, indeed, at that time making inroads into what had so far appeared to be a man's pursuit, and only the coming of the Great War prevented their making further advance in the world of flight.

But when the post-War era dawned, the story started by the pioneers was continued. Once more women took to the air. In Europe and in the United States women aviators, inspired by the heroic achievements of such men as Alcock and Ross Smith, ventured to make long flights across the world. Especially did they aspire to cross the Atlantic, not perhaps alone but at first as passengers, and the first to achieve fame in that risky and sometimes foolhardy game was a young women called Amelia Earhart.

Some time after the end of the War, in which she had served with a Red Cross unit, this quiet and gentle-mannered American girl learned to fly. The wonder and fascination of the air entirely captivated her. Aeroplanes became an outstanding interest in her life. In 1928 her chance came to take part in an Atlantic air attempt. A Fokker seaplane, powered with three 200 h.p. Wright "Whirlwind" engines and fitted with floats, had been prepared for a dash from Newfoundland to Europe, and on June 17, 1928, it rose, not without difficulty, because of its immense load of fuel, from Trepassey. On board the plane, named Friendship, were three people — Commander Wilmer Stultz, the pilot, Mr. Lew Gordon, mechanic, and Miss Earhart, travelling as passenger.

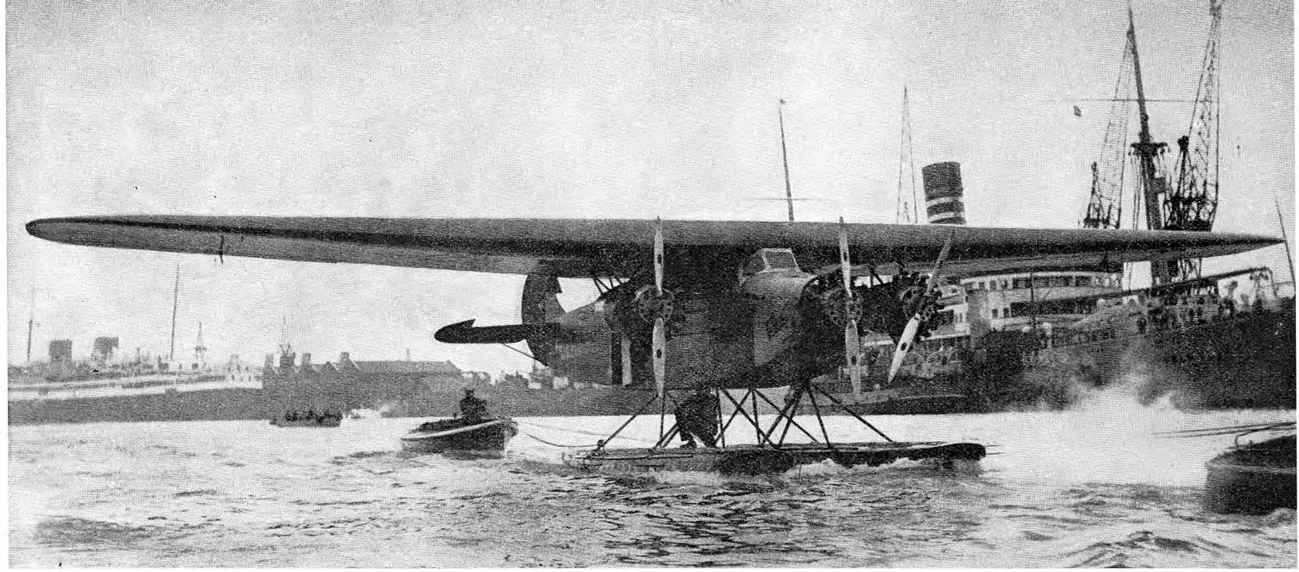
A long journey lay ahead for the voyagers, and soon after the monoplane had started the hours were not without anxiety. Fog, the enemy of all airmen, assailed them, and Stultz, who, besides being the pilot, also acted as radio operator, was kept busy checking his position by wireless communication with ships. Hour after hour the Friendship sped on through the fog, and while Stultz watched his instruments and worked his wireless, his passenger sat quietly in the cabin behind, thrilled by the adventure in which she was taking part.

'LADY LINDY'

The United States are rightly proud of Amelia Earhart, for she stands amongst the world's finest record-breaking pilots. Two transatlantic flights, first as a passenger and afterwards as a pilot, and then a wonderful crossing of the Pacific are amongst her outstanding achievements. In this photograph, taken at Hanworth after her solo Atlantic trip in 1932, her resemblance to Charles Lindbergh, which has resulted in the soubriquet "Lady Lindy," is apparent

Keystone





Then, during the morning of June 18, for a brief period the visibility improved and the pilot was able to pick up a ship in the ocean below.

On coming low, Stultz was puzzled to find that the ship was a liner, apparently making a south to north course—a strange route for an Atlantic-going craft. A doubt crept into his mind as to his own course. Where was he? Where had their plane got to after 19½ hours? Flying now at a low altitude, he came on another liner and endeavoured to get in touch with her by radio and by dropping hastily-scribbled notes. But all was of no avail. For some reason he could not establish wireless communication—and the notes, written and aimed by Miss Earhart, fell wide of their mark. The Friendship flew on. Then, on the far horizon, Stultz, Miss Earhart and Gordon saw the faint outline of land. It was the coast of Wales. In the fog they had flown across Ireland!

Some 30 minutes later the seaplane taxied through the tranquil waters of Burry Port, Carmarthen Bay, and the flight was over. For the seventh time the North Atlantic had been crossed from west to east non-stop by air, and Amelia Earhart had achieved one of her great ambitions.

The realization of another and greater one came four years later when she emulated the great Lindbergh, to whom she bears a striking facial resemblance, in making a solo flight from her native land to Europe. It has been said that she essayed that flight in answer to those critics who had belittled her for being a "mere passenger" in her first transatlantic adventure. Whatever the motive it was a fine achievement.

On the evening of May 20, 1932, she climbed into the cabin of her Lockheed

NEWFOUNDLAND TO ENGLAND

A departure from usual practice in Atlantic flights was made when the "Friendship," a three-engined Fokker seaplane was chosen by the three Americans for their successful attempt in June, 1928. The day after their arrival in Wales they flew to Southampton. Above, the "Friendship" in the harbour; and below (left to right), L. Gordon (mechanic), Amelia Earhart (passenger) and W. Stultz (pilot) with the mayoress of Southampton

'Daily Mirror'





Associated Press

BEFORE FAME CAME

Amelia Earhart was by no means new to the "aviation game" when she flew the Atlantic as a passenger in 1928. She had learnt to fly seven years before, and had a flying experience of some 500 hours. Here we see her beside a training machine during this period. Today she is a vice-president of the National Aeronautic Association of America

Vega as it stood with idling engine at Harbour Grace, Newfoundland. Then, precisely at 7.30 p.m., she thrust the throttle open and in a few moments she was in the air, heading out to sea. The first, second and third hours passed well enough. Her Vega, a sleek and fast monoplane, carried the plucky woman pilot on her way in excellent style. But presently two troubles developed simultaneously. The exhaust manifold of the big 420 h.p. "Wasp" engine fractured, permitting a fierce rush of flame to sweep back over the cowling. In ordinary circumstances in daylight such a mishap would not be of great consequence. But at night the light of the burning gases was bewildering and worrying to the pilot.

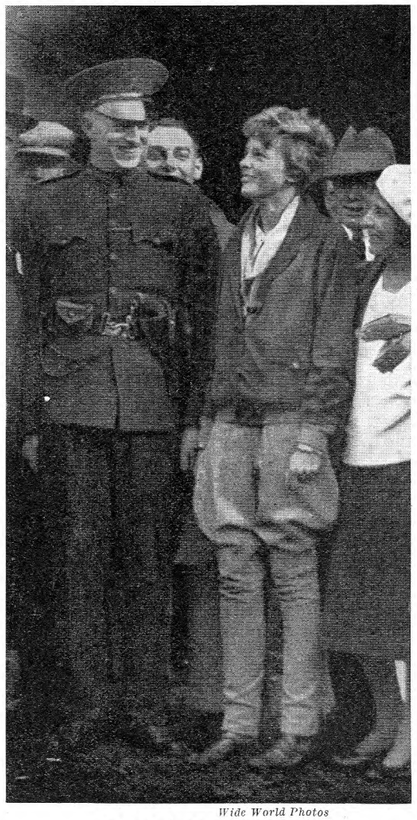
Moreover, Miss Earhart discovered, not without a very natural concern, that a petrol gauge was leaking. But there was nothing that she could do about these two defects—she could but carry on, concentrating on her navigation and hoping for the best as her plane roared meteor-like through the darkness. Later, to add to her troubles, she ran into severe weather. Darkness, a flaming exhaust, a petrol leak, and then rain and heavy clouds.

Fate was working against this courageous lone flyer. Fearful that she might strike the sea, for she was flying blind and with her altimeter out of action, Miss Earhart climbed the Vega high into the night sky. But there another hazard threatened her. The intense cold caused ice to form on her monoplane's wings. Desperately she flew on, counting the hours and waiting for the respite that daylight would bring.

At last, spreading out across the horizon that lay far ahead of the Vega's flame-flecked nose, the faint light of dawn appeared. Slowly the sun was creeping upward. Miss Earhart's spirits rose. An hour or so, and surely she would see land. Eagerly she scanned the dim and misty vista that stretched before her. Soon the sight that had cheered Alcock and Brown thirteen years previously was hers too. Ireland!

In a very little while the Vega skimmed over hedges and landed in a field at Culmore, Derry. The crossing had taken only 13½ hours and constituted a twofold record, for never before had a woman piloted a machine solo across those lonely and treacherous 2,000-odd miles, nor had anyone completed the journey in so short a time. It had been a nerve-racking flight, and when, after the landing, the petrol tanks were examined, it was found that there was just sufficient fuel for one hour's flying—a narrow margin, indeed.

"Lady Lindy," as Miss Earhart was dubbed, was at once fêted by Ireland



Wide World Photos

APPRECIATION

When Miss Earhart landed near Londonderry after her solo Atlantic crossing in 1932, she quickly made friends with the crowds which gathered. She is seen above with an Irish policeman, who is sharing a mutual admiration with the airwoman

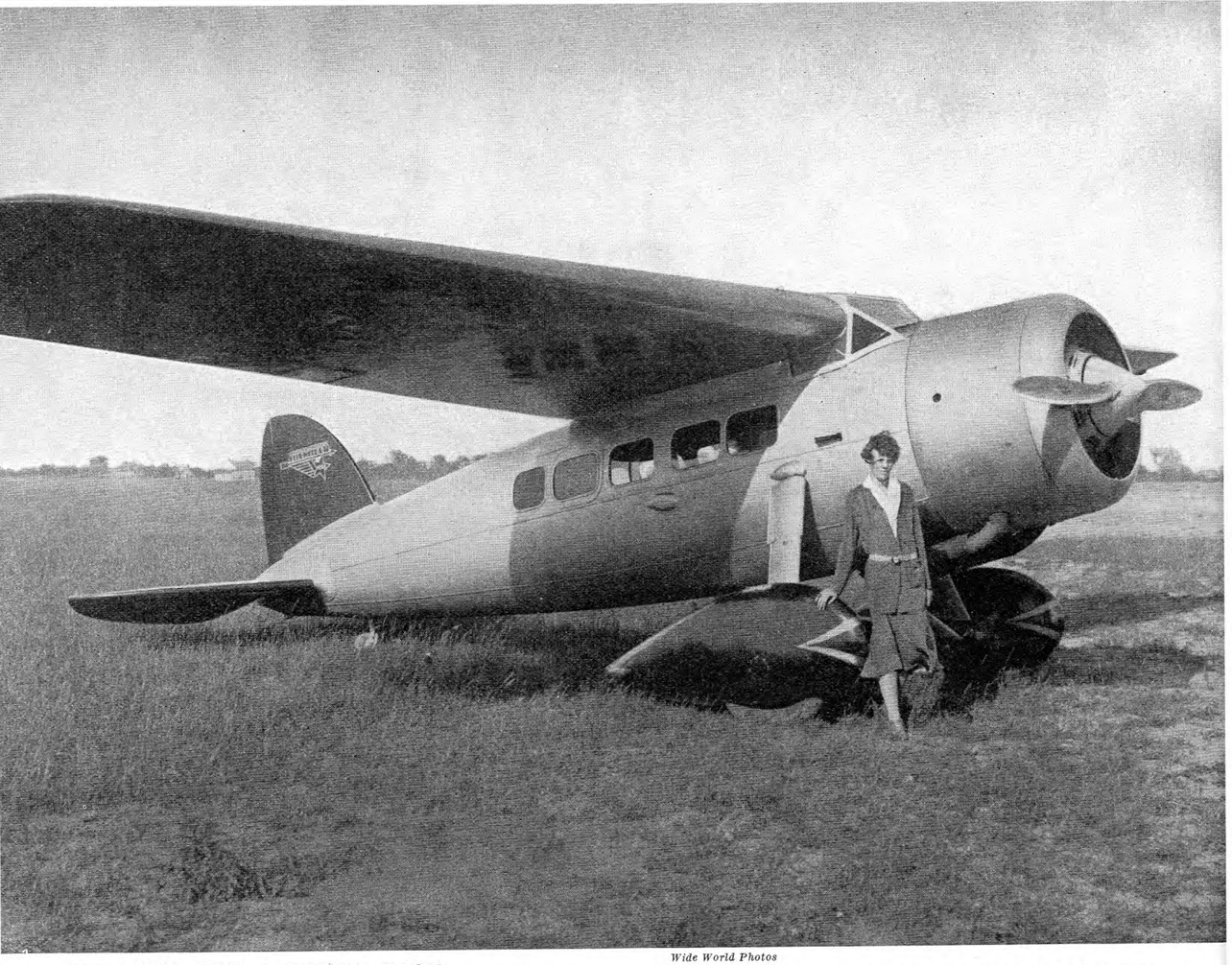


Wide World Photos, and Associated Press

SOLO CONQUEROR OF OCEANS

1932, Harbour Grace (Newfoundland) to Londonderry (Ireland); 1935, Honolulu to Oakland (California). This bare recital of the two transoceanic flights of Amelia Earhart gives little idea of the magnitude of her self-imposed tasks. Her Lockheed "Vega" was no "woman's machine," and she had to trust implicitly to the reliability of the single Pratt & Whitney engine with which it was fitted. Above, Miss Earhart inspecting the "Vega" at Londonderry; below, her machine is seen landing on her arrival at Oakland





Wide World Photos

TRAINING FOR A TOUGH TASK

After taking part, as a passenger, in the transatlantic flight made with a Fokker seaplane in 1928, Miss Earhart did a considerable amount of solo flying in the United States. She gained much experience in piloting a Lockheed "Vega" monoplane, a type of machine that she used on both her solo crossing of the Atlantic in May, 1932, and her Pacific flight in January, 1935. Above, the famous airwoman standing beside her "Vega" at Detroit

and England, and when she returned to the United States she was hailed as one of the modern heroines of the air.

Not long after her triumphant homecoming she aspired to further records in the air. Miss Ruth Nicholls at that time held the record for distance flown in a straight line by a woman, with a fast trip of 2,000 miles across the American continent, and this Miss Earhart planned to beat. And so, in August, she took another Lockheed Vega to Los Angeles, and when all was ready set off on August 24, heading east. Her machine had been specially tuned for the attempt and it bore her swiftly and surely on her way until, when nineteen hours and four minutes had elapsed, she landed at Newark, New Jersey. She had covered more than 2,500 miles and so the record was hers.

This flight was remarkable for the speed at which it was accomplished. It occupied only one hour more than that made by the famous airman, Frank M. Hawks, who, as the creator of many high-speed transcontinental flights both in America and Europe, ranks as one of the outstanding pilots of the United States.

But she did not rest on her laurels, and in 1935 she prepared for another oversea flight, which was as beset with danger as the transatlantic venture. This was a "hop" from Honolulu to California, which involved more than 2,000 miles over the Pacific. When her intentions became known, efforts were made to prevent the airwoman from starting, for no less than ten airmen had perished while attempting the trip before, and the U.S. naval authorities had been involved in a great deal of expense in searching for the missing aviators.

In spite of this opposition, however, Miss Earhart set off on January 12. Using her trusty Lockheed again, she headed direct for Oakland, California. Hour after hour she sat alone in the cabin, her practised hands lightly holding the controls, her calm eyes glancing now at the instruments, now at the void around her. A sudden falter of the engine might well have caused her heart to jump. But the motor, with its rhythmic hum, went on and on, and carried her without a misfire to her goal. When she landed she had covered 2,408 miles in 18 hours 16 minutes. Amelia Earhart, America's greatest airwoman, had succeeded once again.

Miss Earhart, who in private life is Mrs. Putnam, wife of the well-known publisher, by her brilliant achievements in the air acquired many honours and distinctions both in her own country and abroad, and she remains a leading and respected figure in American aviation.

ANDREE: A PIONEER OF THE NORTH POLE

By Capt. J. Laurence Pritchard

Of Andrée and his two companions it is true to say, as Tennyson said of Franklin, "The white North hath thy bones." An account of their balloon journey, put together from Andrée's diaries that were found thirty-three years afterwards, is indeed an epic of the Poles

On July 11, 1897, three men set out in a balloon from Danes Island, Spitsbergen, to make the first attempt in the history of the world to explore the Polar regions from the air, and, if possible, to find the North Pole. For thirty-three years there was silence from those three men. Expedition after expedition searched for them in the icy Arctic wastes, until in August, 1930, the world was electrified to learn that the bodies of these air pioneers had been discovered and that Andrée had left behind him diaries which told much of what had happened when the balloon had disappeared over the ice floes.

The three men concerned in the first attempt to reach the North Pole by air were Salomon August Andrée, Niles Strindberg and Knut Fraenkel. Andrée, who was the leader of the expedition, first took an interest in aviation in 1876, when in America, and began to study ballooning. From the first he was convinced that it would be possible to go over the North Pole, and he seized every opportunity of meeting Polar explorers and learning what he could of the weather conditions.

In 1893 he made his first balloon, the Svea, and carried out many ascents to get experience. He made most careful scientific records of all his flights, as he realized how important it was to know everything possible if his early dream was to come true. In only a matter of two or three years his fame had become world-wide, and in February, 1895, he gave a lecture, which startled his hearers, outlining his proposals for a Polar expedition by balloon. In this lecture he stated how large the balloon must be and gave other details necessary for the success of his proposal, which proved that he had considered the scheme from every angle.

Despite many criticisms from the newspapers and well-known men, the thought of going over the North Pole by air seized upon the imagination of the public. By June the money required for the expedition had been subscribed. The balloon, built in the winter of 1896–97, had a capacity of 170,000 cubic feet, and was made of pure silk throughout for lightness and strength. Andrée fitted it with sails in the belief that he would be able to guide it to some extent.

On board were carried provisions for six months. It was in the days before wireless, and thirty-six carrier-pigeons were taken to give the world news of the progress of the balloon. Sledges, guns, fishing tackle and the like were carried, so that, if the explorers were forced down, they could support themselves for a long time. Many long months of careful preparation were necessary before the start of the flight. The whole fabric of the balloon, instruments, food supplies, sledges and so on had to be taken by ship to Danes Island, Spitsbergen, from where the start was made, with all the necessary apparatus for making hydrogen and filling the balloon on the spot.

The balloon, called the Eagle, was inflated in a big canvas-sided building which had been erected to protect it from the winds, and these prevented a start being made for some time. The morning of July 11, 1897, however, broke fine and clear, and Andrée gave orders for the canvas building to be demolished ready for the start. At 1.46 p.m. all the ropes were cast loose, and with a cry of "Hurrah for old Sweden" the three explorers began their amazing voyage.

But many who were watching had a premonition of disaster, for it was seen that, at the start, the drag rope of the balloon had broken loose, and it was on the use of this drag rope that Andrée had relied for safety. It was, however, too late for anybody to do anything.



E.N.A.

PIONEER OF AIR EXPLORATION

Salomon August Andrée (above), Swedish engineer and explorer, and head of the Stockholm Royal Patent Bureau, made, with two companions, the first attempt to reach the North Pole by air in 1897, when the only proved form of flying machine was the drifting balloon. He had previously made a balloon voyage from Gothenburg to Stockholm. The story of the gallant failure of the Polar flight was reconstructed by discoveries made in 1930



Photos: Keystone

AN HISTORIC 'SNAP'

This photograph of Fraenkel standing triumphantly beside a Polar bear that he had shot during their last march is more historic than at first appears, for it was among those developed by Professor Herzberg 33 years after the film's exposure and icy burial in 1897, when Andrée and his party met their death

What exactly happened when the balloon disappeared into the mist was not known until over thirty-three years later. The story can only be pieced together from the diaries and notes left by the three men.

For many hours the balloon drifted at a height of about 1,500 feet, taken this way and that by the changing wind. "It is not a little strange to be floating here above the Polar Sea," wrote Andrée in his diary. "To be the first that have floated here in a balloon. How soon, I wonder, shall we have successors? Shall we be thought mad, or will our example be followed? We think we can well face death, having done what we have done."

They were terribly prophetic words. Below them lay "the sea full of finely divided ice," impossible to land in. About half-past five in the afternoon the first four carrier-pigeons were released, but none of them ever reached their destination. Shortly after, the ice floes became bigger. The balloon carried a number of floating buoys, the first of which, with a message, was dropped overboard at 10 p.m. It must be remembered that the midnight sun was above the horizon, so that the balloon was being borne forward the whole time in the sun's rays, upon which Andrée had relied in order to keep the necessary buoyancy by heating the hydrogen. The first buoy dropped overboard was not found until over three years later, on August 27, 1900. "Our journey has hitherto gone well," wrote Andrée. "Weather magnificent."

All through the night the balloon drifted on and all through most of the next two days and nights. But there was a dramatic and disturbing change in the flight after the first day. Mists began to rise, obscuring the sun, and the balloon began dropping lower and lower, despite the throwing out of ballast, and for hours on end it drifted only a few feet above the ice floes, the broken remains of the drag rope dragging over the surface. Everything which could be spared was thrown overboard in a desperate effort to make the balloon rise.

Andrée knew there was an ever-increasing danger of the basket being dashed against the ice as the balloon drifted. On the morning of July 13, 1897, he wrote in his diary: "No living creature has been seen the whole of the night; no bird, no seal, not a walrus, not a bear." The three men were alone in the air and drifting fast to disaster. For the whole of that night the balloon, laden down by the damp, foggy air, had rested on the ice, the wind having completely dropped, but with the coming of the sun, as the fog dispersed, it rose again. That afternoon four more pigeons were released, one of which reached a Norwegian trawler. The message gave the position of the three men and added: "All well on board. This is the third pigeon post. —Andrée."

All that day the balloon drifted just over the surface of the ice, the basket bumping continually, and the first few hours of July 14 passed amid the same monotonous, comfortless conditions, the three men knowing that in a very short time they would have to abandon the balloon to its fate. At 8 o'clock that morning the balloon bumped for the last time.

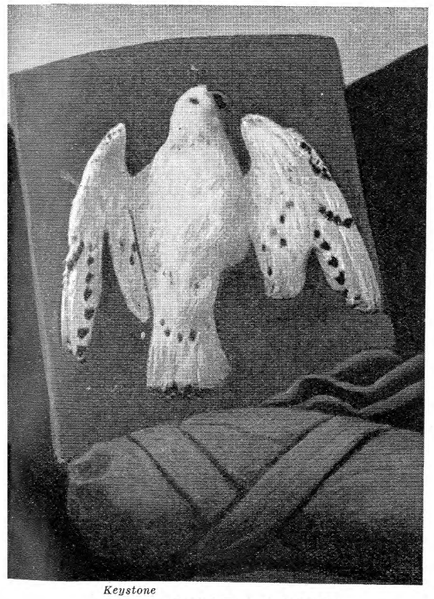
"We jumped out of the balloon," reads the laconic entry in Andrée's diary. The great air journey had ended, and the three men, tired and hungry, found themselves on the terrible floating ice, over 200 miles away from the nearest land.

Nevertheless, they had saved their instruments and sledges, and there began that last great struggle across the ice, in the hope of reaching safety—ice moving and drifting, sometimes breaking under them, sometimes piling up in huge masses and threatening disaster.



RELICS OF ANOTHER CENTURY

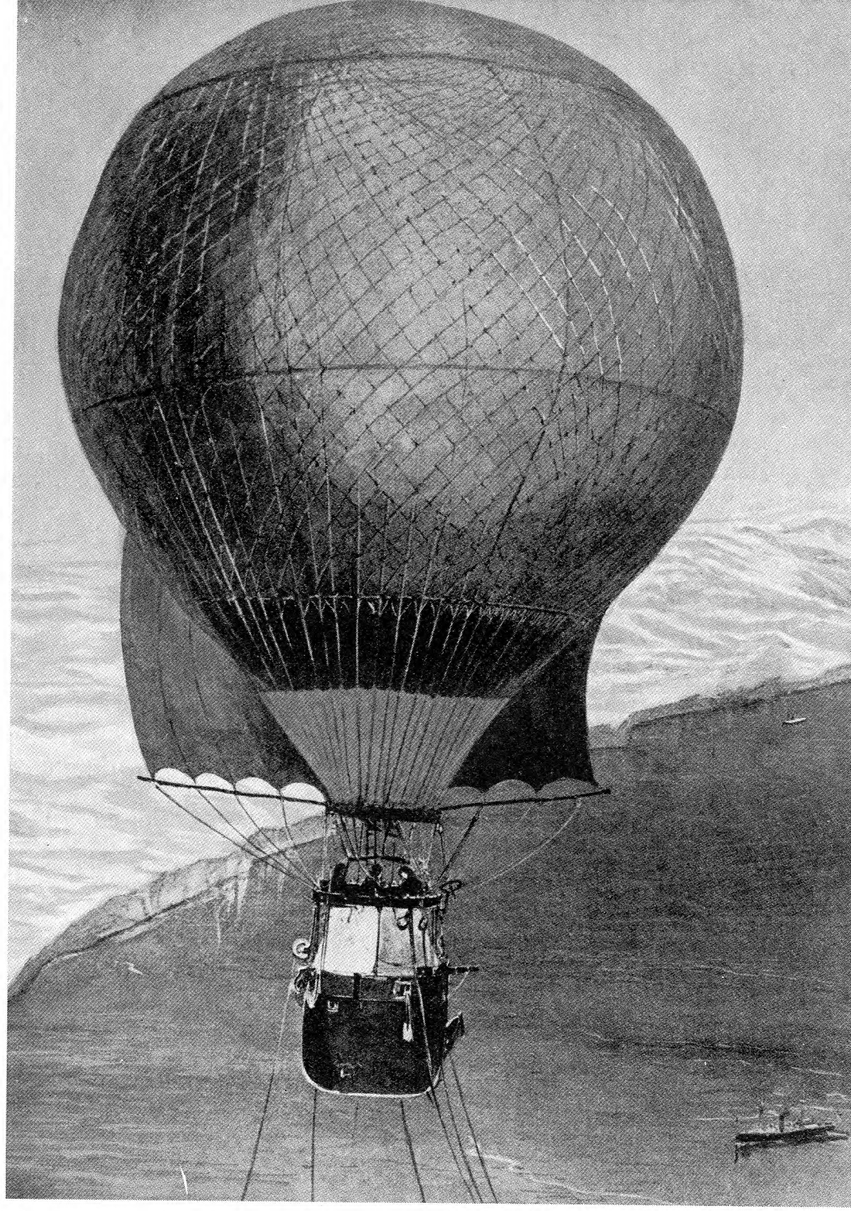
Among the impedimenta found lying next to the bodies of Andrée, Strindberg and Fraenkel on White Island in 1930 were these optical instruments—binoculars, with their case, and a telescope—mute testimony to the ambitious intentions of the expedition, which, alas, yielded so little of scientific value. An exhibition of these and other relics was held in Stockholm soon after their recovery



Keystone

LAST FLIGHT

Andrée carried a number of carrier-pigeons in his balloon, for wireless was then practically unknown, and no other form of long-range communication was possible. Only one of the pigeons released reached its goal, and this soon after the balloon's departure. The historic photograph above is of the pitiful corpse of a bird which died with its master

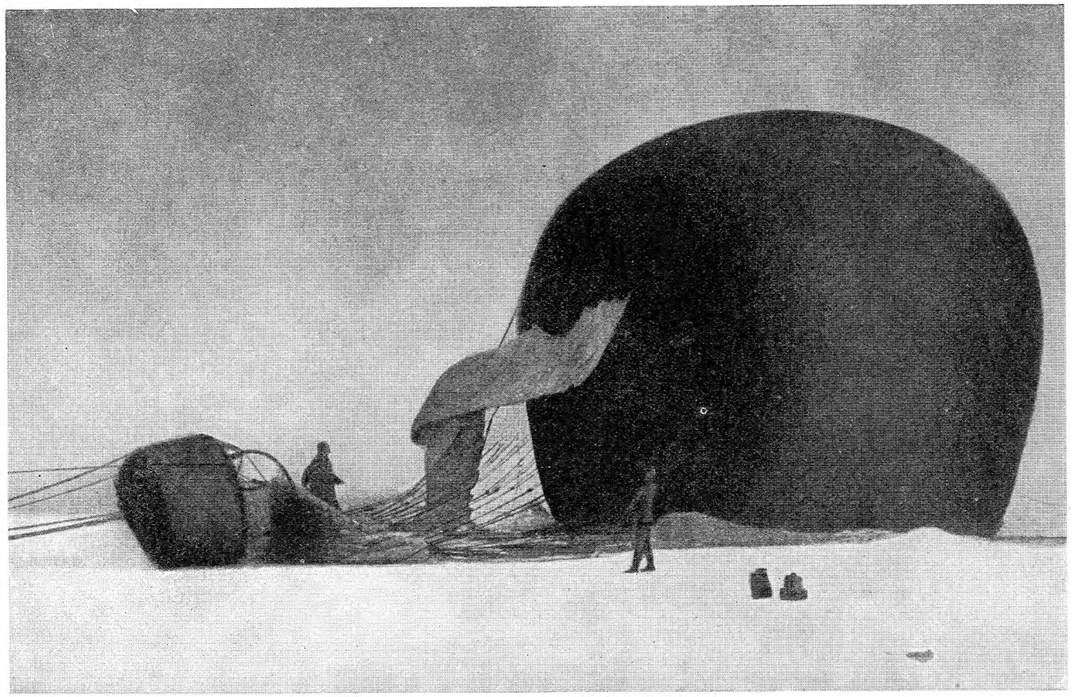


INTO THE WHITE NORTH

Andrée's balloon "Eagle," built by Lachambre in France, was extremely large for the time, the envelope being of 4,500 cubic metres capacity. The basket contained a bed, provisions and instruments, but the crew normally stood on a platform above. Several influential people subscribed towards the cost of this elaborate apparatus, which ultimately left Spitsbergen on July 11, 1897, as pictured above

The three explorers decided to try to make for Franz Josef Land, some 200 miles to the south-west. On July 19 Andrée records that they shot a bear and had a real meal for the first time for days. Day by day they continued the hopeless struggle, and every day Andrée wrote down in his diaries an account of the previous day's struggle, while Strindberg also left a log of what was happening. During that long trek and drifting over the ice the three explorers took photographs of what they were doing, of their fight for safety. Thirty-three years later these amazing photographs were found and developed, to tell their own story.

On September 17, after two months of drifting, they sighted, six miles away, White Island, where their remains were



Photos: Keystone

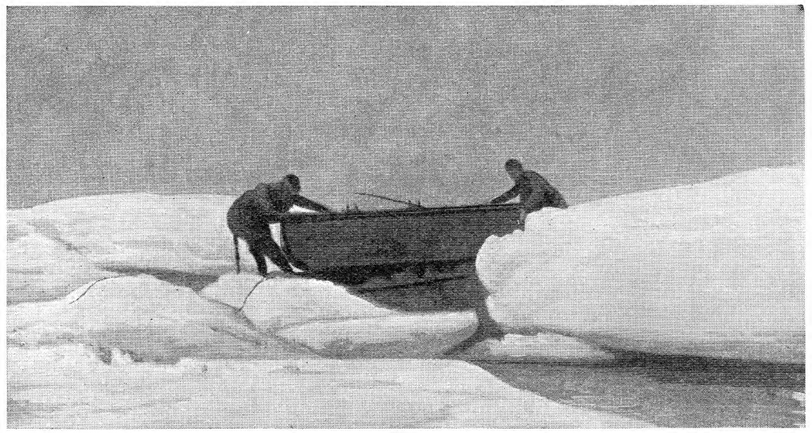
FROM A NEGATIVE 33 YEARS IN ICE

The two photographs in this page, developed, like the upper one in page 706, from films found 33 years after exposure, show actual incidents in the amazing adventures of Andrée and his companions in 1897. Above, the balloon's final landing, after a voyage of only 65 hours, at a position some 300 miles from the start and 500 miles from the Pole

ultimately found. But they were on floating ice and had to go where the tides drifted them. It was not until October 5 that they set foot on firm land, and then, tragic to relate, Andrée's diary becomes illegible.

What exactly happened then will never be known, but the greatest tragedy of all is that they had come across 200 miles of drifting ice to safety and, within a few days of landing, disaster had overtaken them. When their remains were found it was seen that they had plenty of food and ammunition, so it was not starvation which had caused their deaths. The most likely thing is that all three were overwhelmed by the cold and died in their sleep.

Although the outcome of this somewhat premature, and certainly very hazardous, flight was tragic, the name of Andrée will live on in the annals of Polar exploration as a true pioneer of the air era. The sadness inspired by his final failure is tempered with a sense of something heroic in Andrée's nature. This is well expressed in the simple yet thrilling narrative of his diary, with its accompanying photographs, forming a human document comparable to that of Captain Scott of immortal memory, and which, unlike the unfortunate author, was rescued years afterward from the icy clutches of the frozen North.



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Knowing that the balloon was now useless, and that striking northward would be suicidal, Andrée reluctantly led his little party in a last vain effort to reach civilization. Among their equipment was a sledge, here seen in one of Andrée's own photographs, being hauled over the terribly difficult and treacherous surface of the ice

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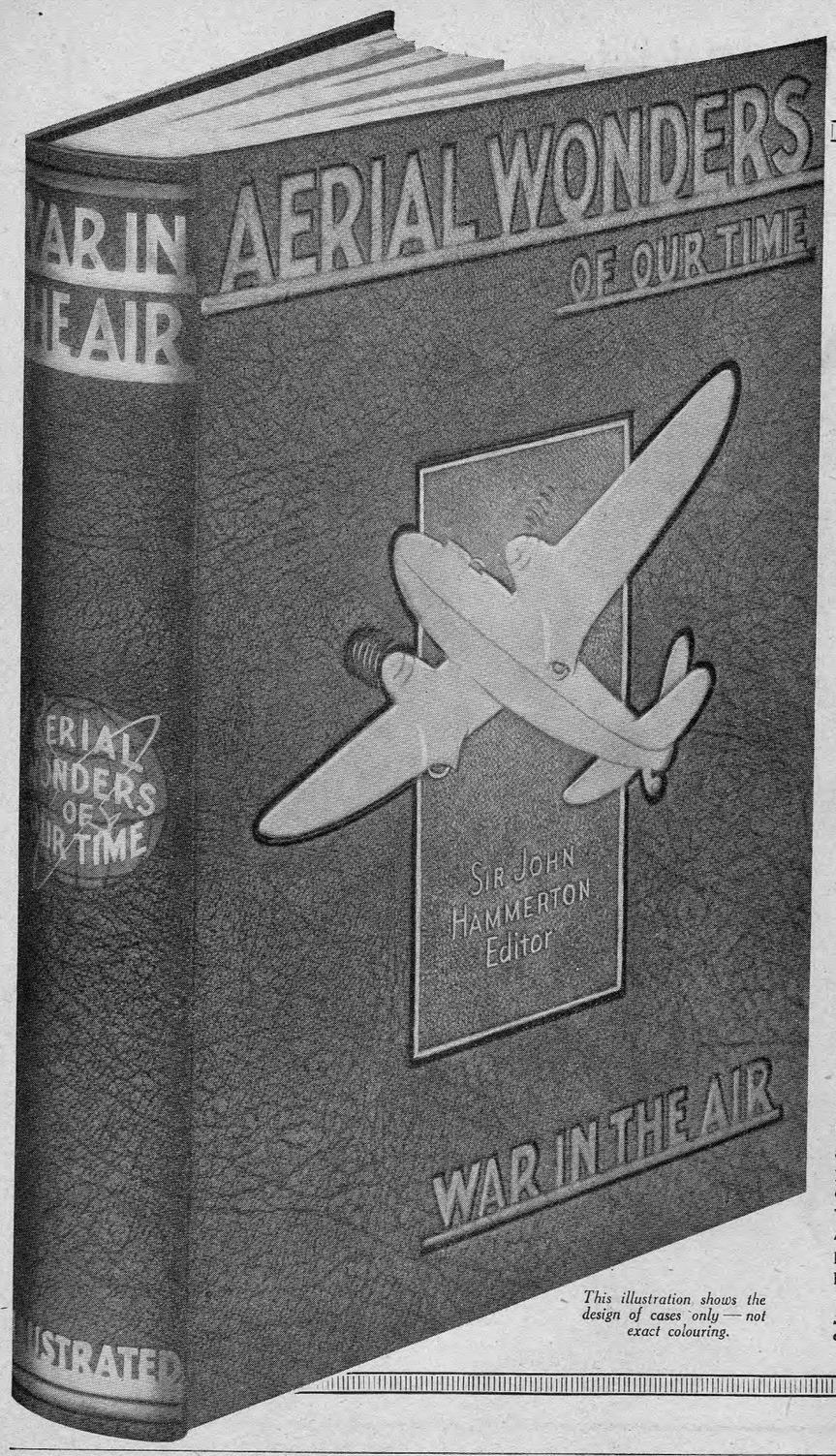

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Part 23 Complete in 25 Weekly Parts **SEVENPENCE**

WAR in the AIR

AERIAL WONDERS OF OUR TIME

SIR JOHN HAMMERTON
Editor



Editorial Eddies

John Carpenter House, London, E.C.4.

I HAVE just received a copy of a book entitled "Flying Memories," by Mr. Stanley Orton Bradshaw, who is one of the extremely small number of artists who specialize in aerial matters. It contains 48 pictures of incidents and phases of aviation, both in war and peace, the illustration being on one page, with the explanatory letterpress opposite. For instance, one of them shows the method of attack adopted by Captain Albert Ball, V.C., a subject with which readers of WAR IN THE AIR are familiar. Another illustrates the last victory of James McCudden, while on the other side we have the deaths of Werner Voss and Richthofen. Leaving the War, the artist gives an illustration of the first R.A.F. pageant in 1920, and the first R.A.F. flight to the Cape in 1926. We are shown, on another page, two aeroplanes on the way to Kabul, to release the inmates of the British Legation and other Europeans during the rising there in 1928.

AS travellers by air know, smoking is not allowed in the air liners belonging to Imperial Airways, Ltd., and to most other lines. Many of my readers may have seen in the daily papers recently an account of an incident in one of these liners. Although ordered by the captain to put out his cigarette, a passenger refused to do so and the matter was referred to the courts. The case will raise an interesting point of law. Has the captain of an air liner the same powers as are possessed by the captain of a steamship? These are considerable, and, turning up the Universal Encyclopedia, I read: "He (i.e. the captain) has power to enforce discipline, his authority being analogous to that of a parent over his child or a master over his apprentice or scholar." He can take any measures he thinks necessary to maintain order and discipline on board.

BUT to return to the question of smoking. Smoking is allowed in some of the American air liners, and in an account of the new German airship, the LZ129, it is stated that the rooms in this gigantic vessel include a smoking-room. This has special fireproof walls, and strict precautions are taken to ensure that no passenger inadvertently leaves when still smoking, while cigarettes and matches are only available in these quarters. Another reason why smoking is permitted in this liner, and not in many others, is that the German vessel is an airship and her envelopes are filled with helium, which is less inflammable than the gas formerly used. Another safeguard is that the fuel tanks are situated well away from any danger of ignition from dropped matches and the like. The new ship has been named the Hindenburg. The fare for the maiden trip, which will start on May 6, will be about £83, and she is expected to make the return journey in a week. This Part of WAR IN THE AIR contains many interesting details about this gigantic airship.

A RECENT suggestion is for a new air line for a mail and eventually a passenger service between London and Honolulu. An American who is interested in this project has stated that this long journey can be done in 48 hours and that this should be possible early next year (1937). He elaborated his prophecy by explaining that Imperial Airways, Pan-American Airways and Air France aimed to cross the Atlantic in 16 hours, that another 16 hours would suffice for crossing from New York to San Francisco, and that Pan-American Airways would thence take the passenger to Honolulu in another 16 hours. The aeronautical correspondent of "The Times," in commenting on this proposal, says that flying westwards across the Atlantic with the flying boats which will begin the services will certainly mean a longer schedule than 16 hours. The flying time of the Shorts of Imperial Airways, and the Sikorskys of Pan-American Airways, will be at least 23 hours. With a difference of five hours between English and American clocks, this will appear as a schedule of 18 hours westbound and 28 hours eastbound. Similarly, the flying hours between New York and San Francisco will be 19, and from there to Honolulu 18.

ABOUNDING as it does with sharks, the Timor Sea, known as a storm centre, is rather dreaded by the aviator, although, according to a statement in "The Times" of January 21, 1936, no aeroplane has ever been forced down in it, and this notwithstanding that, during the past year, mails and passengers have been flown once a week in each direction over its 500 miles that separate the island of Timor from the airport of Darwin in Northern Australia. However, the Australian Government, foreseeing doubtless an increase in traffic across this sea, is providing a motor-boat that will patrol the routes taken by the air liners. This will carry a crew of five and will be able to take 50 people aboard.

THE Air League of the British Empire announces that Empire Air Day is to be held on Saturday, May 23. The Air Ministry has agreed to the participation of the Royal Air Force, and, as was the case last year, the majority of flying clubs will also assist. Empire Air Day was inaugurated by the Air League in 1934 to provide an opportunity for the public to get into closer touch with aviation, and the late George V gave a lead by visiting the R.A.F. station at Bircham Newton. The success of last year's Day, when thousands of people attended aerodromes all over the country, will still be fresh in everybody's memory. In these two years Empire Air Day has brought more than £7,000 to aviation charities. Again this year Empire Air Day will be celebrated in the Dominions overseas.

THE receipt during the last few days of several letters asking when a complete volume of WAR IN THE AIR can be obtained is a reminder, if such were needed, that the work is approaching its end, and that subscribers will be thinking of having the loose Parts bound. Several times in the past I have pointed out the importance, from the subscriber's own point of view, of having the Parts bound up as early as possible, so I need not say anything more on that matter at the moment. I will say, however, that the publishers are preparing for subscribers to WAR IN THE AIR a particularly attractive binding case, one of which is on my desk at the moment. It is in a very fine quality of antique blue rexine, the back being heavily gold-blocked and the sides having an effective embossed design. The publishers will bind the 25 Parts, constituting the volume, in this case with stained and brushed edges to the leaves. The inclusive charge will be 5s., 2s. for the case itself and 3s. for the actual binding and the cost of packing and return carriage. With each binding case the publishers will send a tasteful title page, frontispiece and table of contents.

Order Part 24 of WAR IN THE AIR Today—Out on Thursday, April 16

GERMANY'S GREAT AERIAL LEADERS

By Capt. J. B. Sterndale Bennett, M.C.

Germany's vast achievements in aerial warfare must always be identified with the names of Immelmann, Boelcke and Richthofen. Below is an account of their individual successes and methods, together with a brief description of those of other leading German airmen

THERE has been occasion in the course of these chapters to mention individual deeds of the outstanding German airmen. It is now necessary to show how each in turn affected aerial warfare from the German point of view, temporarily at least, wresting an advantage from their opponents and handing on to their successors new traditions in air fighting.

Before, however, describing the deeds of the German aces, something may be said about the energetic personality who directed them. General von Höppner joined a cavalry regiment and was on the staff when the command of the air force was offered him. He took up this position at the moment when the German air force was recovering its morale and, owing to his foresight, the German airmen never again had such a feeling of helplessness as was theirs during the first few weeks of the struggle on the Somme. Under Höppner the control of the whole air force was centralized and it included also the anti-aircraft defences.

First of a brilliant galaxy was Max Immelmann. This young Saxon had been a cadet before the War and on its outbreak joined his regiment as a reserve officer. It was not long, however, before he transferred to the Flying Corps (he had a natural mechanical genius allied to the true pioneering spirit), and, after training, joined Flying Section 62, which, through his exploits and those of his friend Oswald Boelcke, was destined to become famous. This was in the early days of 1915, when air fighting was still in its infancy, when formation flying was as yet unknown, and when there were many reconnaissance and artillery aeroplanes still taking the air unarmed, except perhaps for carbine or revolver.

Immelmann immediately showed himself to be a fearless pilot, but he was very much more than that. With no traditions to guide him he invented a series of manoeuvres in the air which made him a most deadly opponent and for a long period brought him successfully out of every conflict. His brother, who edited his memoirs, claims for him that at one time he attained complete aerial supremacy over a section of the front between Lille and Péronne. Known as the Eagle of Lille, Immelmann was almost always the lone flyer—ranging the heavens in search of his prey, attacking relentlessly when he had marked down his victim and escaping with remarkable agility when in danger.

Immelmann was essentially the pioneer, the first great fighting scout produced by Germany, and as such he quickly became an almost legendary hero in a country given to the cultivation of heroes. Honours crowded upon him. Every enemy aeroplane that fell to his gun meant another flashing order on his breast. His actual toll, however, was small compared with that exacted by later pilots, for when he was killed in June, 1916, he had claimed fifteen victims. The Germans, unwilling to admit that their hero met his death at the hands of an aerial opponent, still support the story that he was brought down by anti-aircraft fire. (*See* pages 289-90.)

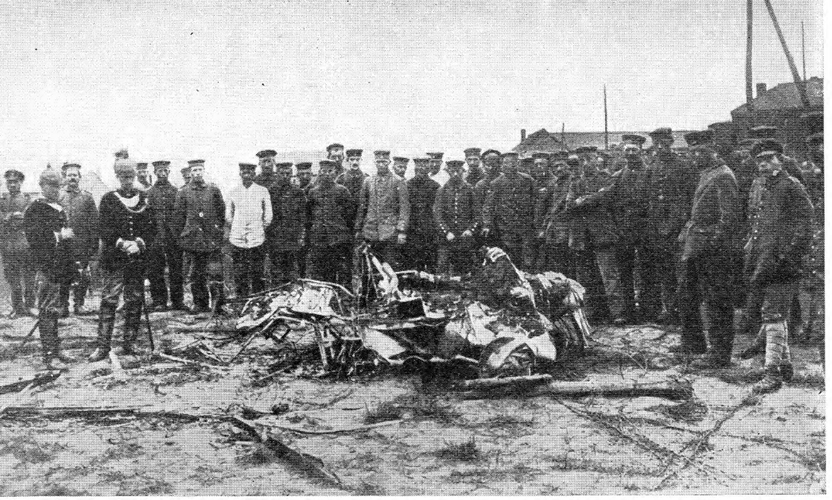
Immelmann's contemporary, who lived to pile up a much greater score and exercised a more profound influence on the development of the German air force, was Oswald Boelcke. He, too, started his career as a cadet, and transferred to the Halberstadt Flying School in the



Imperial War Museum

'EAGLE OF LILLE'

Oberleutnant Max Immelmann, who is seen here standing beside the wreckage of one of the machines he shot down, was Germany's first "star" fighting pilot. His career, like that of many other war-time airmen, was as brief as it was brilliant, for he was killed in June, 1916. In all he claimed fifteen victories and gained many decorations, including the Ordre pour la Mérite. His exploits in the Lille-Péronne area brought him the soubriquet "Eagle of Lille"



IMMELMANN'S FUNERAL PYRE

Immelmann's end, on the evening of June 18, 1916, was swift and terrible, for when he was attacked by Lieutenant G. R. McCubbin of the R.F.C. his Fokker monoplane fell wingless. In this photograph, taken shortly after the crash, German officers and men are seen standing around the crumpled wreckage of the machine of Germany's first air fighter

early summer of 1914. By September of that year he had started his war career as a pilot on the Western front, with the advantage of serving in the same section as an elder brother, Wilhelm. At first his experiences differed little from those of the ordinary pilot engaged on normal duties of reconnaissance, etc.

His chance came when, in May, 1915, Anthony Fokker introduced his famous E3 machine, incorporating a machine-gun which, by means of a synchronized gear, could be fired forward through the arc of the propeller. Boelcke was the first German pilot to fly one of these machines. Of his first fighter, Fokker E3, a single seater, he said himself, "The strong man is mightiest alone." His success was immediate, and from the day of his first victory, July 4, 1915, until his death it was uninterrupted, save for a period of enforced absence from the front. It must, in justice, however, be noted here that the majority of both Boelcke's and Immelmann's victories were over British two-seaters, ill equipped for fighting.

Boelcke, like Immelmann, encountered many of his victims on lone flights. He had supreme confidence in his machine. "As long as one keeps one's head and judgement, my fast, nimble Fokker makes a fight in the air hardly more dangerous than a motor trip." Victims fell to him with almost monotonous regularity. Every day he flew added to his mastery and to his skill in manoeuvre, and his quick brain absorbed every experience of value.



E.N.A.

BOELCKE THE CHIVALROUS

Oswald Boelcke (above) was esteemed by friend and foe as a brave and chivalrous fighter. Originally rejected for military service as being unfit, he eventually succeeded in joining the service, in which he achieved world fame. Boelcke survived Immelmann by four months, being killed in October, 1916

Oswald Boelcke was no mere fighting pilot; he was quickly in the councils of the High Command, and on his pioneer work was based much of the theory and practice of air fighting as it existed until the end of the War. He had achieved his ninth victory when he received the highest German decoration, the Ordre Pour la Mérite, and shortly afterwards, it being recognized that his influence on scout flying was too great to allow his life to be lost in combat, the Emperor forbade him to fly again and he was sent on an official mission to the East.

But the Emperor and the High Command had reckoned without the highly critical situation which was to arise during the 1916 battles of the Somme. The undisputed mastery which the British obtained in the air demanded the most urgent measures. It was clear that they must recall their most brilliant airman and risk that valuable life once more in defence of the Fatherland. Boelcke was given the task of forming a fighting "Staffel," with authority to pick his pilots at his own discretion. One of the first chosen was a young Silesian airman who was already making a name for himself—Baron Manfred von Richthofen.

Boelcke's "Staffel" (there is no adequate English translation of this word, so let it be understood as Boelcke's air command) quickly made itself felt. The leader, before his death, achieved forty victories, his "Staffel" many more, and undoubtedly he did for a time regain a measure of aerial supremacy for the Germans. But what is more interesting than his individual victories or those of his subordinates are the principles which he instilled and which remained in force until the end of the War. They are thus summarized in "Knight of Germany," by Johannes Werner, translated into English by C. W. Sykes:

Try to secure advantages before attacking. If possible keep the sun behind you.

Always carry through an attack when you have started it.

Fire only at close range and only when your opponent is properly in your sights.

Always keep your eye on your opponent and never let yourself be deceived by ruses.

In any form of attack it is essential to assail your opponent from behind.

If your opponent dives on you, do not try to evade his onslaught, but fly to meet it.

When over the enemy's lines never forget your own line of retreat.

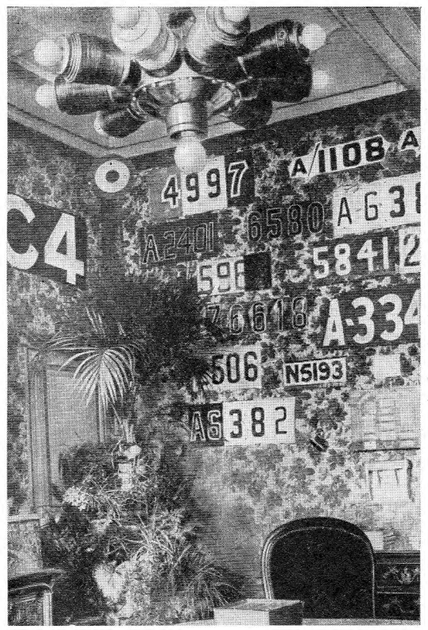
For the "Staffel." Attack on principle in groups of four or six. When the fight breaks up into a series of single combats take care that several do not go for one opponent.

The manner of the death of this great German airman, on October 28, 1916, is related in another page. It was the result of a pure accident when one of his own men, rushing to his aid during a dog-fight, collided with him and sent him spinning to the ground.

The torch of Boelcke was taken up by his pupil and protégé, Richthofen. This young Silesian aristocrat had seen service in the early days of the War as a cavalry officer, both on the Eastern and Western fronts. He was by nature a hunter and a fighter, and the inactivity which fell upon his branch of the service with the stabilization of trench warfare became intolerable to him. He

FIGHT RELICS

The arrogant streak in Richthofen's character is reflected in this photograph of his own apartment, the walls of which are covered with relics of his victories. Hanging from the ceiling as a candelabra is a rotary engine which, like the numbered strips, was taken from an Allied machine





Photos: Imperial War Museum

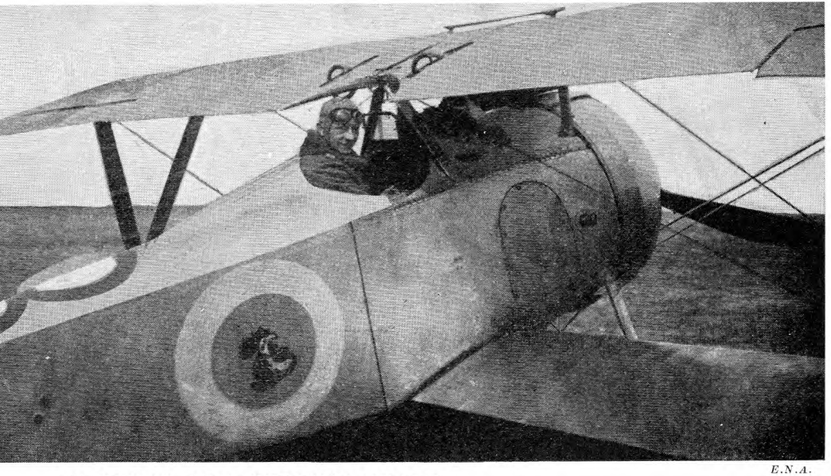
AUF WIEDERSEHEN!

In this photograph Baron Manfred von Richthofen is shown with his dog, Moritz, which was his constant companion during leisure periods at the ace's aerodrome. As is related in this page, Richthofen was a cavalry officer before he joined the German Flying Corps. His score of 80 victims made him the greatest of all German fighting pilots. He was killed in a fight with British single-seaters in April, 1918, when Captain A. R. Brown attacked him at close range in a Sopwith "Camel"

transferred to the German Flying Corps, where his early adventures were not particularly notable. His career began when he came under the influence of Boelcke, and eventually he doubled the record of victories of his master, bringing down 80 victims.

Baron Manfred von Richthofen was built in a different mould from either of his two great predecessors. He was not their equal in the qualities of modesty or of chivalry. His vanity demanded always trophies of the chase. The Emperor and the kings of Germany could not decorate his breast quickly enough, but he must needs give orders to a Berlin jeweller to make a silver cup in celebration of each of his victories. It must have hurt his vanity when, after 60 of these trophies had been made, the supply of silver ran out and there were no pots on his mantelpiece to commemorate the smouldering wreckage of his last 20 victims.

But Richthofen was no mere pot-hunter. In his red aeroplane and at the head of his "Staffel," he became truly a terror of the Western front. His fame



E.N.A.

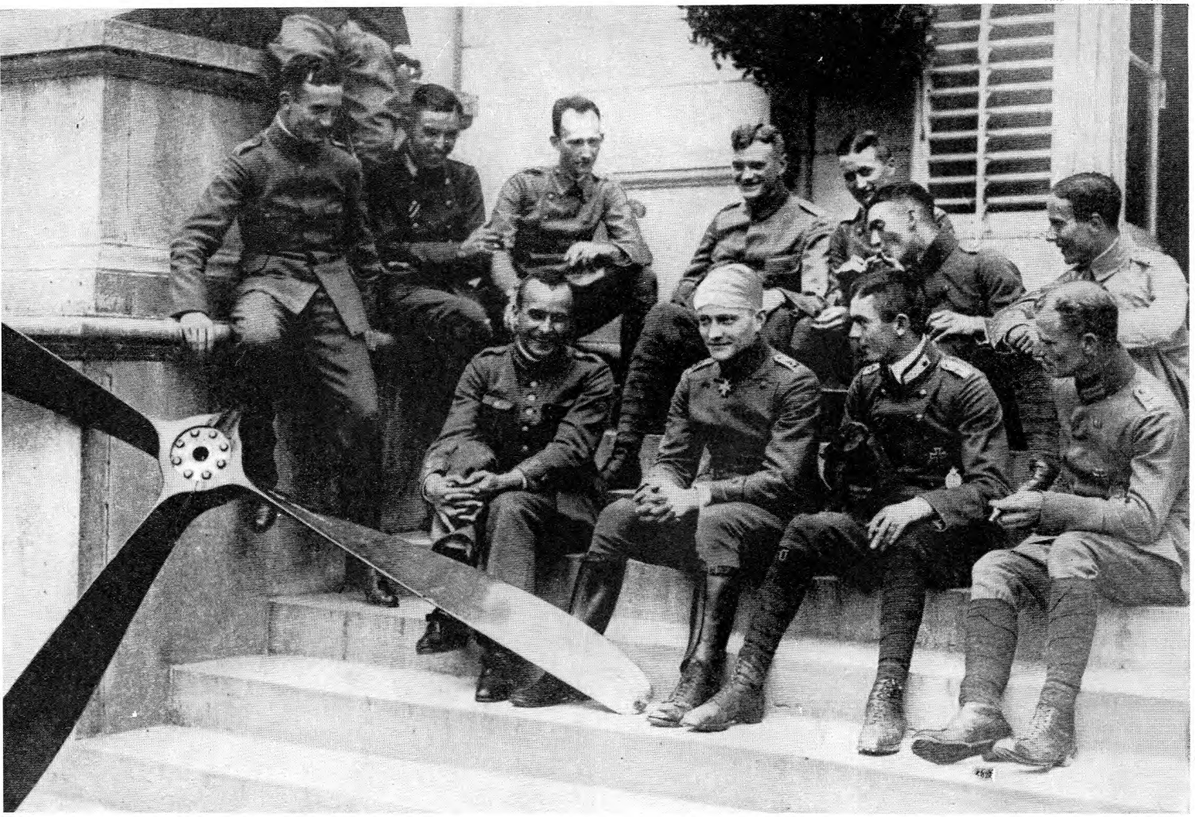
GERMAN ACE—FRENCH CRAFT

A lesser known pilot of the German Flying Corps, who, nevertheless, fought with great courage and success, was Captain Ritter von Schleich, who is seen here seated in the cockpit of a captured French Nieuport "Scout." He was a most spirited fighter and had many adventures while on active service on the Western front. One of his many audacious exploits while flying a captured French machine is recounted in page 713

spread abroad, so that he came to be known, and is still known, as the greatest of all German air aces. He had an undoubted flair for organization, which made him a highly successful leader. It was as a leader he fought—seldom as a lone flyer. He owed his success very largely to the perpetually offensive spirit of the British Flying Corps, for if they had not gone out to meet him it is doubtful if he would have searched them out; he had not much taste for fighting beyond his own lines. But his policy succeeded, and while he lived the Germans could never count themselves inferior in the air. As in the case of a number of other famous aviators, the manner of his death is still a matter of controversy, but there is, in reality, no doubt that he was shot and killed in the air by a Canadian pilot, Captain A. R. Brown.

Richthofen's method has been roughly summarized in the words, "Go for your man and get him." He had no use for the stunting pilot, and boasted that he himself had never looped the loop, nor ever intended to do so. In "German War Birds," by Vigilant, he is reported as having told his pilots: "Never try and shoot holes in a machine; aim for the man and make sure you do not miss him. If you are fighting a two-seater, get his observer first; until you have silenced his gun, do not bother about the pilot." In other words, the advice was to kill the occupants, when the aeroplane would crash on its own account.

Manfred von Richthofen had a brother, Lothar, who became a member of his own "Staffel" and accounted for 40 Allied aeroplanes. Lothar was of a more adventurous and careless disposition, and had an extremely lucky escape when he was shot down by a British airman. He did not long, however, survive the War. Some attempt was made at the time to credit him with the death of Captain Ball, V.C. This was never properly substantiated.



THE 'RED KNIGHT' AND HIS MEN

Throughout the German Flying Corps Richthofen was revered as the ace of aces. In this photograph he is seen with some of his fellow officers, who display that care-free spirit found so often amongst the fighting airmen of all the belligerent countries. Richthofen's head is bandaged as a result of a wound sustained in a fight in July, 1917. In the foreground is a smashed airscrew taken from an enemy plane

Imperial War Museum

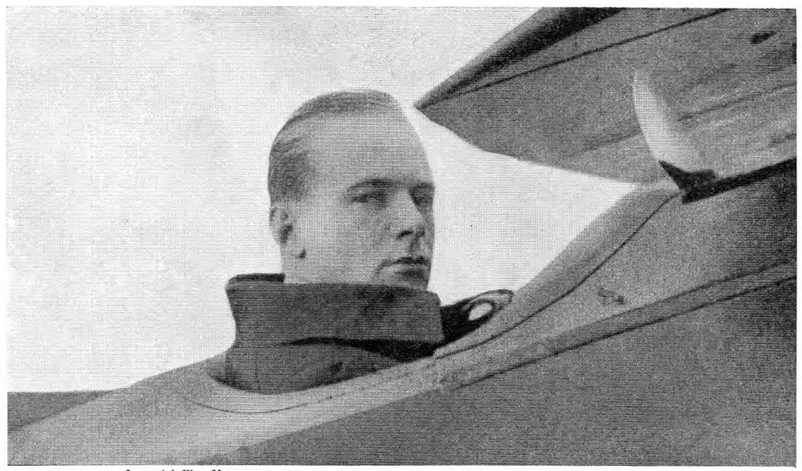


G.P.A.

GÖRING—AIR DUELLIST

General Göring, Nazi chief and staunch supporter of Hitler in his early struggles, served as a pilot during the Great War and claimed a score of 22 enemy machines. In the last year of the War Göring (then a captain) was in command of a fighting unit and he received a number of decorations. In this photograph he is seen in the cockpit of a Fokker triplane, one of the most successful of Germany's fighting aeroplanes

A romantic figure whose exploits took place on another front was Lieutenant von Eschwege, known as the "Eagle of the Aegean Sea." After a spell in the trenches and reconnaissance work in a two-seater over the Western front, he became a single-seater fighter operating from the aerodrome at Drama, in Greece. He was an intrepid and extremely resourceful pilot who ranged the skies in search of his prey, taking the offensive whenever it offered and earning the respect of his enemies. As has been related, he met his death when attacking a dummy balloon which had been specially prepared for his destruction. Eschwege claimed 20 victims, a large total considering the forces employed on the Macedonian front. General Hoeppner, head of the German air force, said of him: "It was essentially owing to Lieutenant von Eschwege and the 'Jagdstaffel' he created that we were able to hold the enemy more or less in check."



Imperial War Museum

RICHTHOFEN'S SUCCESSOR

Ernst Udet, seen here in a Fokker D.VIII, came second only to the great Richthofen as an ace, with 62 confirmed victories. Of all the leading German scout pilots, he alone miraculously survived and lived to add to his fame by his exploits as an airman in the post-War years. He had an amazing escape when he collided with another machine, but emerged unscathed from the crash

Another very able German pilot was Captain Ritter von Schleich, whose toll of aeroplanes was 35. Schleich was inspired with a youthful and dare-devil spirit. It is related of him that he once (defying all orders to the contrary) took up a French Spad machine, which had already been marked with the German Maltese cross, and crossed the French lines unmolested.

As it happened, the German markings were unnoticed and, encouraged in his impudence, he actually joined a flight of French Spads and flew with them over the German lines. He was in the end discovered, but he made a brilliant getaway to his own aerodrome, where he received not a decoration for gallantry, but a reprimand for foolhardiness and disobedience.

Of all the German pilots who survived the War, none is better known to the world at large today than General Göring. Although his notoriety scarcely depends on his exploits as an airman, he was a keen and successful fighter who made himself felt on the Western front. Göring's toll by the end of the War amounted to 22 victims.

World's Wonder Planes. 16

NEW WAYS IN LONG-RANGE FLIGHT

By Major C. C. Turner

The Mayo composite aircraft, described in this chapter, is an attempt to increase the range of the aeroplane, which is limited by the amount of fuel it can carry. It consists of two machines, the smaller and upper one being fuelled for a greater range than the lower one, which launches it at the appropriate time and then returns to the base

AEROPLANES all depend for their support in the air upon their speed through it, and their speed through it is dependent upon the engine and propeller, and, therefore, upon the use of fuel. The amount of fuel they can carry is limited, chiefly because of its weight, but in some small measure by the space it occupies. It follows that the fuel steadily being consumed during flight eventually comes to an end and the aeroplane must descend.

Except for record-making purposes the aeroplane must, in order to justify itself, carry something besides fuel and pilot; it must transport either a commercial or a war load, and, unless the amount of such load is reasonably large, the effort is not worth the trouble and expense. These are considerations which limit the distance an aeroplane should be expected to travel on one load of fuel to something between 200 and 600 miles, and at 600 miles the proposition is not, strictly speaking, commercially sound.

But there are strong urges to the attainment of greater distances. The Atlantic crossing calls for at least a 1,300-mile stage, via the Azores, or the 1,900-mile ocean stretch from the west of Ireland to St. John's, Newfoundland, and for war purposes, also, there may be occasions for long flights, for which fuel must be carried and, in addition to fuel, a load of bombs and defensive armament. For many years past this problem has engaged the attention of experts, and various methods for increasing the range combined with useful load have been proposed.

Of these, the most remarkable is the Mayo composite aircraft, which has won the approval of the Air Ministry and Imperial Airways, and with State assistance is the subject of a full-scale experiment. Its construction has been entrusted to Short Bros., of Rochester, whose chief designer, Mr. Arthur Gouge, is satisfied as to its practicability.

Let us glance first at the solution of the problems that have been proposed, and in some cases tried, before the Mayo composite aircraft was designed. One of these was catapulting. As described in another chapter (pages 417 and 420), this method is in use on a trans-South Atlantic German service. But in that case the catapult is not employed for the purpose of sending an aeroplane off with a load of fuel or freight which it could not normally take off with, but is merely a method of launching from a mother ship stationed along the route, in order that the stages may be of reasonable length. The catapult method has also been suggested as applicable to the problem of long-range flying.

It is possible to catapult much heavier aeroplanes than come within the power of the German apparatus, which is capable of launching 14 tons. Moreover, land aeroplane catapults have been demonstrated, and the apparatus can be of a mobile character. Further, it has the advantage of being readily laid down in any direction, according to the wind.

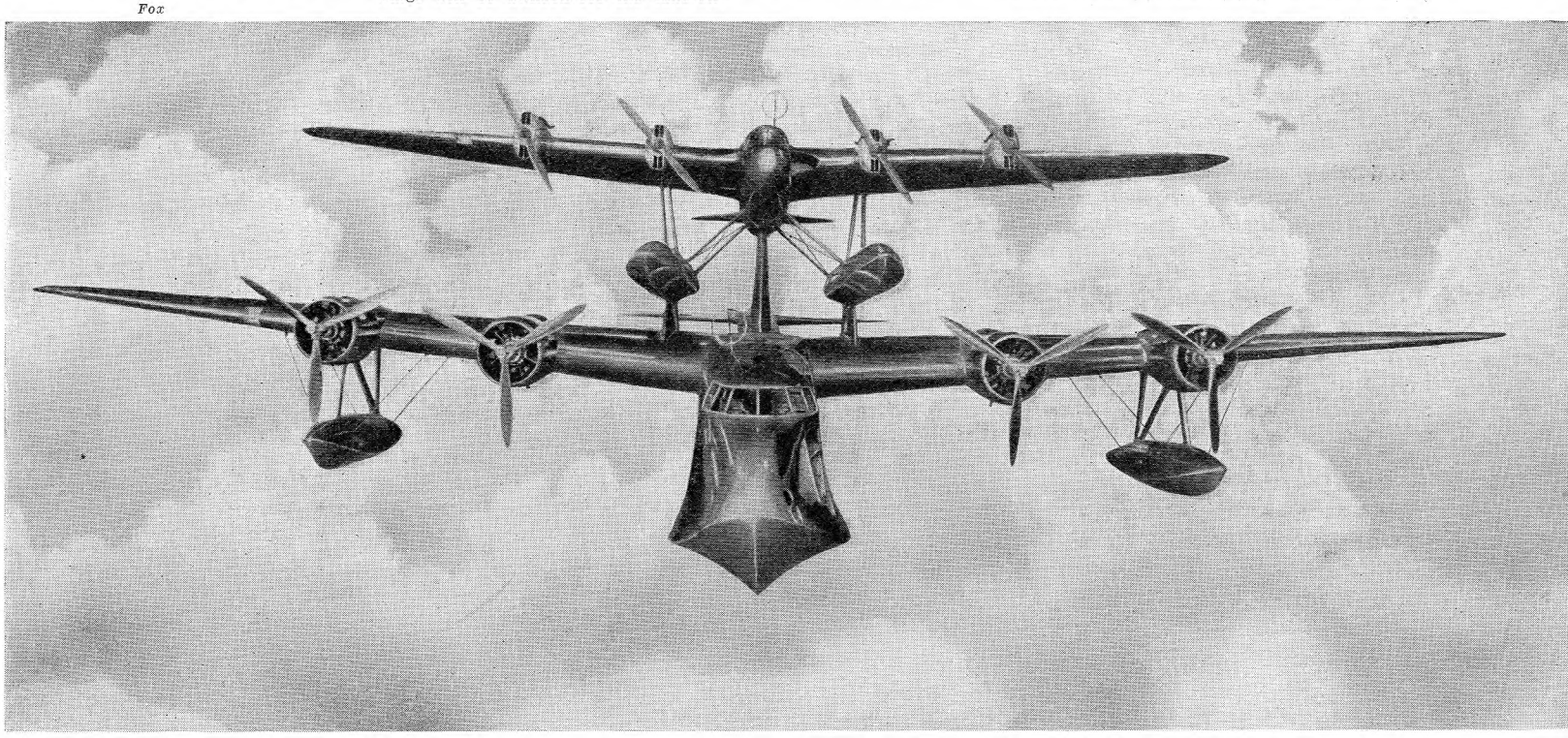
As applied to the problem of long-range regular air transport, however, the method has the disadvantage of sending off an overloaded machine at a low altitude in not much better case than that of overloaded aeroplanes taking off under their own power for long-distance record attempts. If anything goes amiss at the critical moment the result may be serious.

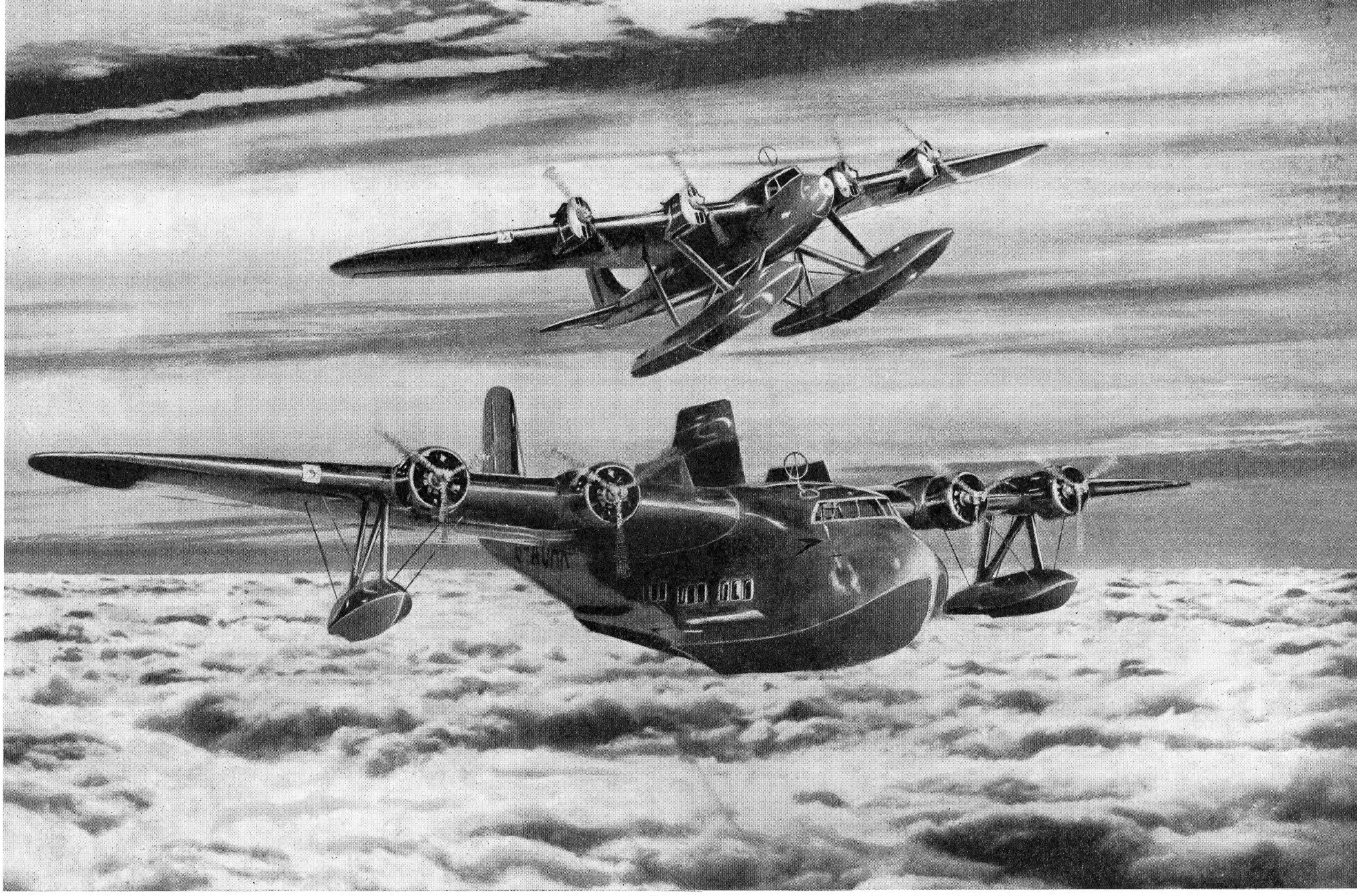
Moored aerodromes in the oceans have been strenuously advocated in

A TEMPORARY ATTACHMENT

The idea underlying the Mayo Composite, while not entirely novel—a scout was released experimentally from the upper wing of a flying boat in 1918—is sufficiently revolutionary to grip the imagination of those who eagerly await an Imperial service across the Atlantic. This drawing shows how the two aircraft—the mail-plane above and its "auxiliary" below—are attached to each other. All eight engines and the lift of both wings will be utilized for the take-off

Fox

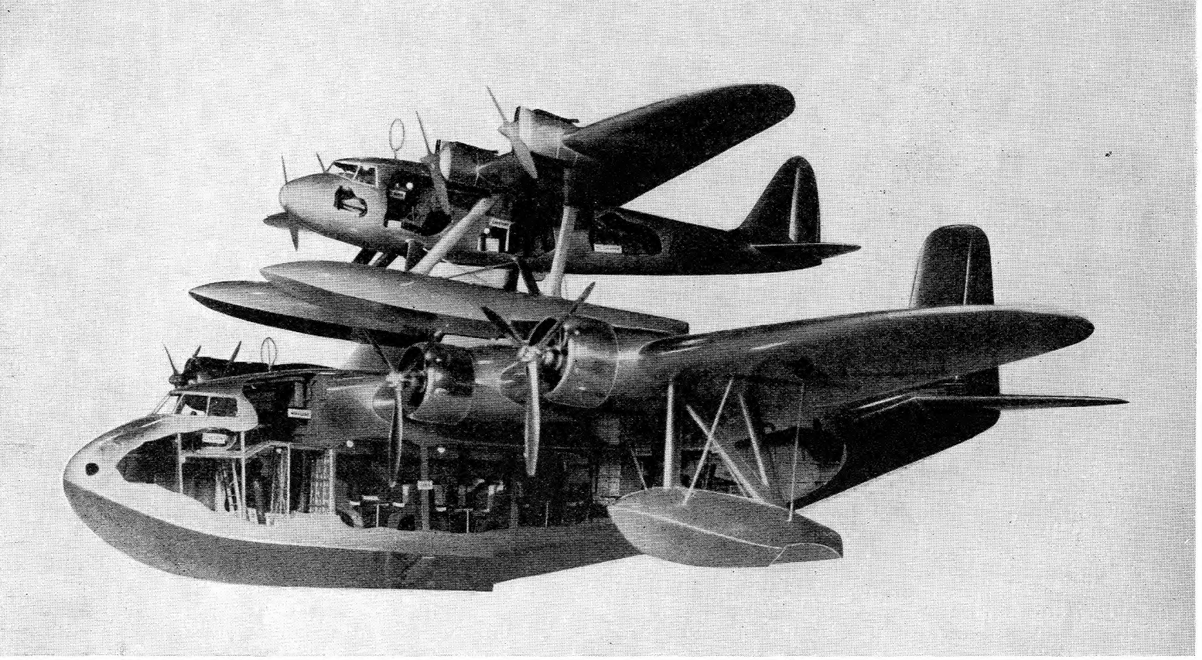




Fox

EXPEDITING THE ATLANTIC MAIL

This drawing, based on models, is of the Composite craft, built by Short Bros. to the designs of Major R. H. Mayo. The "pick-a-back" scheme has been developed for the experimental North Atlantic mail service of Imperial Airways. The flying boat, lightly loaded, has released the smaller seaplane, carrying mails and enough fuel for the non-stop flight, at its operating height



Fox

BEARING ANOTHER'S BURDEN

The lower part of the Mayo Composite, a model of which is seen above, consists of a powerful flying boat with four Bristol "Pegasus" engines and a wing-span of 114 feet. It is lightly loaded to enable the whole craft to lift off the water. The upper machine is a long-range float-seaplane with four Napier "Rapier" engines

the United States for many years past. A chain of such stations, if they are feasible, would reduce the length of the stages to 500 or 600 miles, a most attractive proposition. Strong as was the case made out for such seadromes, they have not been adopted, and probably the great cost has been a consideration. Some account also has been taken of the objection that, despite careful calculations and planning by the engineers who have devoted expert knowledge to the problem, there is some uncertainty about mooring in very heavy weather, about the obstacle to navigation they might afford if adrift, and the international issues raised by their existence in time of war. Little financial support for the idea has yet been found either in the United States or in Great Britain, but, meanwhile, the Germans have succeeded in their more modest and less costly method of maintaining a stationary steamship half-way across the Atlantic.

Refuelling in the air has been the subject of thousands of practical demonstrations, and it offers the least expensive solution of the problem. It can now be carried out with remarkable precision, at any rate in fairly good weather. No doubt it is possible also at night. It would, however, be difficult in poor visibility.

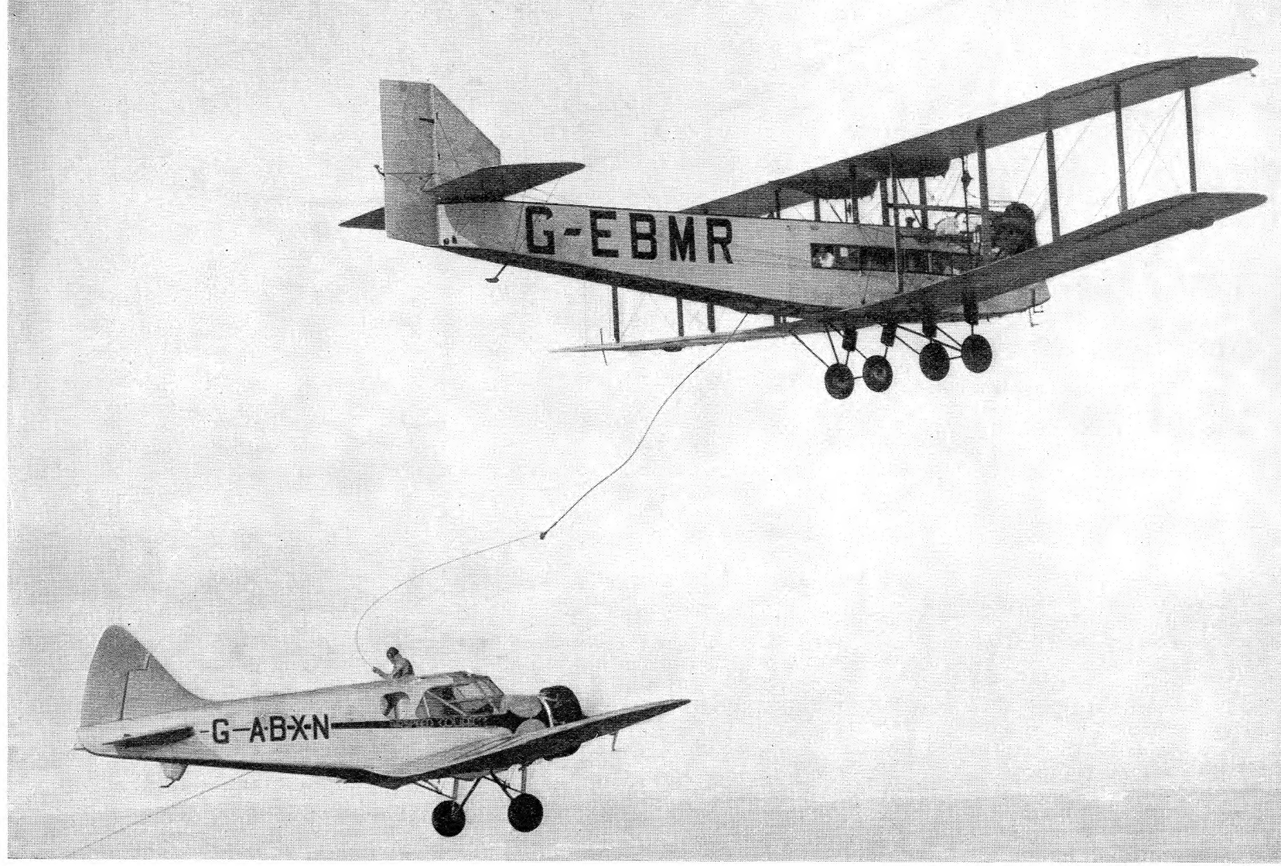
It is, I think, significant that in the United States, where it has been the subject of the greatest efforts, no practical purpose has so far been found for it. Although it has been available for some years past, the highly experienced air-line operators of the U.S.A. have so far rejected it. But, no doubt, catapulting and refuelling would, on occasion, have great value in military operations and are worth study and experiment for that purpose.

There are many people who hold that the aeroplane and the flying boat will provide their own solution, and point to the steadily increasing range attained without costly extraneous aids. Support for this view is given by improved methods of aeroplane construction, by which, without sacrifice of strength, a saving of weight is effected, and, as a consequence, the fuel or freight-carrying capacity increased. The "geodetic" method of construction, for example, has already been adopted for certain aeroplanes for the Royal Air Force. This method consists of comparatively light strips of metal construction, forming a web of the shape of the wing or the body of the aeroplane. By comparison with the hollow, hard shell method of construction, in which the strength is due to the stoutness of the shell itself, the saving of weight is about 40 per cent.

The lines of the members forming the web of metal are determined by the shortest possible path between fixed points on a cylinder, a globe or any curved object. If you take a cylinder, for example, fix a peg to the top of it, and another peg to the bottom at some distance along it, and attach a string to the two pegs, drawing it taut, you will find that if you deflect the string at any point it will instantly spring back into position. The path it takes is spiral in appearance, yet it is the most direct possible. Herein lies the secret of the geodetic method of construction, which under severe tests has manifested remarkable strength for weight.

Now, although on the wing or the body of an aeroplane its weight-saving is very high, it is clear that it does not save on engine weight, or on the weight of passengers, instruments and equipment, and that, therefore, its proportional saving, taking the fully equipped machine, is by no means so high as 40 per cent. It may be only 10 per cent, but if it be as much as 10 per cent it is of great importance.

Moreover, geodetic construction could be used in conjunction with other things. It could be adopted for catapulted machines, or machines refuelled in the air, thereby enhancing the advantages afforded by them. The progress of flight is carried on over a wide front, and it must never be assumed that success at one point should be the signal for abandonment of advance at other points. For example, the variable-pitch propeller is sometimes scouted as unnecessary owing to this or that improvement in some other direction. But that is a fallacy, for there is scarcely any aeroplane of more than moderate speed to which the variable-pitch propeller is not a great advantage, whilst its greatest advantages are secured when it is



'Daily Mail'

REFUELLING IN MID-AIR

Another way in which flying range can be increased is by replenishing the fuel-tanks of the aeroplane from another machine whilst in flight. Here we see Sir Alan Cobham conducting experiments in the vicinity of Ford aerodrome. The mechanic seen in the lower plane has just caught the fuel-pipe let down from the larger machine. The operation is one which calls for great skill and patience

used in conjunction with other recent improvements.

All this leads to the novel method known as the Mayo composite aircraft, than which few inventions have come in for keener discussion. In a word, it involves the carrying on top of a large aeroplane a smaller machine so laden that it could not take off under its own power at less than about 100 miles per hour, loaded either with fuel for great range, or else with a heavy proportion of freight.

This method has the advantage of launching at a considerable height—say, 5,000 or 6,000 feet, or more—so that the objection that arises in the case of catapulting is overcome. There would be plenty of time to jettison the fuel in the case of a mishap, and once this was done the machine could then land normally.

Major R. H. Mayo, however, saw fuller possibilities in the method than any that had previously been considered. He went into the problem in detail with a view to securing perfection in releasing and launching, and worked out all the necessary calculations, a formidable business.

Once this was done, he produced his scheme, and experts of the Air Ministry approved it. As a result, the Ministry decided to further the project of a full-scale investigation, and Imperial Airways, impressed by the possibilities of the scheme, resolved upon a mail-carrying experiment.

In this experiment the lower component is a big monoplane flying boat with four Bristol "Pegasus" engines, and the upper component a smaller four-engined seaplane. In taking off, all eight engines may be run; and, incidentally, the calculations show that the take-off will be a short one. On the attainment of the desired height, and when the composite is flying at 100 to 120 miles per hour, the releasing gear is operated and the carrier aeroplane falls away, the separation process providing for an immediate wide vertical distance between the two. Having separated in this manner, the launched seaplane will pursue its flight towards its destination, and the large flying boat will return to its base.

All details of the mechanism have the approval of acknowledged experts, and independent authorities have been consulted and have worked out a large number of schemes for the utilization of this remarkable system. It is, indeed, quite a mistake, albeit a common one, to suppose that the composite aircraft of the first experiment is the only one and only kind.

This particular method can be employed for the launching of a high-speed craft, a long-range craft, a slow machine, a short-distance heavy-load-carrying one, and in other ways. The launched machine at the end of its journey will have used up fuel and will be able to alight normally. It can, of course, be used for ordinary purposes until it returns to its own base, or to any other which is provided with a carrier-plane.

If it should be desired, the lower machine can be the load-carrier, and the upper, by means of its wing-area and power, the assistant for its take-off. By this means a large passenger-carrying flying boat might obtain a considerably increased range.

Epic Flights of Famous Flyers. 14

FLIGHTS OF BRITISH AND FRENCH WOMEN

By Grenville G. O. Manton

Record-breaking in the air is no longer a pursuit followed exclusively by men, for during the post-war era women have won fame and distinction by their brilliant flying achievements. Here in this chapter the courageous exploits of such Englishwomen as Lady Bailey, Mrs. Victor Bruce and others, together with those of two notable French women pilots, are recounted

THE era of aviation since the Great War has been crowded with remarkable and startling developments, not the least of which is the success of women as aeroplane pilots.

As has been remarked in a previous chapter, the fact that women fly is no novelty, for in the years before the Great War both Britain and France had their airwomen. But it has been left to the women of the decade since 1925 to show that, in the art of flying and the adventure of record-breaking, they can vie with men and sometimes better them in feats of skill and endurance. This was first evidenced shortly after the flying club movement started in 1925, and women as well as men began to swell the ranks of aeroplane pilots.

The light aeroplane at that time had reached a really practical form, and the little D.H. Moth, then of only 27–60 h.p., was used with great success as a school machine. Instructors often found that women were apt and ready pupils, and before very long a number had qualified for their "A" licence. At first the light aeroplane was generally looked upon as a pleasure machine for use only in good weather and as a means of gaining experience in the air, but in 1926 two men, Captain T. Neville Stack and Mr. B. M. Leete, set off from Stag Lane aerodrome, Edgware, and flew, in two Moths, to India by a circuitous route. They flew in all sorts of weather, made a 230-mile crossing over the open sea from Malta to the North African coast and eventually reached Karachi without mishap. Their flight demonstrated the scope of the light aeroplane and gave an added impetus to private flying.

Other long flights followed and in these women began to take an active part. One was Mrs. Keith Miller, who with Captain W. N. Lancaster made an England-Australia flight, when they used an Avro Avian light plane. Their flight was noteworthy, not for any record set up, but for the way in which Lancaster and Mrs. Miller carried on in the face of persistent misfortune.

The pair left Croydon aerodrome on October 13, 1927, with the intention of setting up a record. But luck was against them on more than one occasion. When nearing Bushire, a defect developed in the magneto of their engine and they were forced to land. They were delayed there for several weeks before the arrival of spare parts enabled them to resume. They went on and eventually got to Sumatra. Then, at Muntok, there occurred another forced landing. The ground was difficult and the Avian was crashed, while both Mrs. Miller and Lancaster were slightly injured.

Undeterred by this disaster they at once made arrangements for the supply of replacements, and, with their machine rebuilt, they eventually reached Port Darwin after making a daring crossing of 500 miles across the Timor Sea. Though the flight had occupied several months, it aroused favourable comment, for only three other machines had ever been flown along that trying route. And certainly Mrs. Miller had shown a stamina and courage that did her great credit.

In the meantime another British airwoman, Mrs. S. C. Eliott-Lynn, was coming to the fore. She was one of the first members of the London Aeroplane Club and qualified for her "A" pilot's licence at Stag Lane aerodrome in November, 1925, with a D.H. Moth. Mrs. Eliott-Lynn became a consistent flyer and began to pile up a large number of hours in the air on various types, including an S.E.5a, a war-time single-seater. On February 12, 1928, she left Cape Town in an Avro Avian to fly alone to England. It was a bold venture, for only one pilot had successfully accomplished such a trip, this being Sir Alan Cobham, who piloted a D.H.50 in 1926 and was accompanied by Mr. Elliott and Mr. Emmott.

Heavy obstacles had to be contended with and there were many unforeseen



Topical

TO AUSTRALIA IN 1927

Mrs. Keith Miller (above) was the first woman to journey from England to Australia by air. This she did in 1927-28, when she accompanied Captain W. N. Lancaster in an Avro "Avian." Mechanical trouble, a crash and bad weather delayed them so that the journey occupied five months



Wide World Photos

WOMEN SOLOISTS OF CAPE FLIGHT FAME

In 1928 both Mrs. S. C. Eliott-Lynn (above) and Lady Bailey (below) were engaged on solo flights between England and South Africa. Mrs. Eliott-Lynn (afterwards Lady Heath) used an 80 h.p. "Cirrus"-engined Avro "Avian" light aeroplane and, leaving Cape Town on February 12, arrived at Croydon Airport on May 17. It was the first time such a flight had been accomplished by a woman. Lady Bailey flew in a D.H. "Moth" from London to the Cape via Malta and Cairo, reaching her destination after numerous delays and adventures. In 1929 she made a return flight by way of the Belgian Congo, Angola and the French Congo

Keystone





FRANCE'S LEADING AIRWOMAN

Maryse Hilsz, who is seen here standing beside a French-built D.H. "Gipsy Moth," established a great reputation as a pilot by her numerous long-distance flights in high-powered machines. Her journey in 1934 from Le Bourget, the air port of Paris, to Tokyo and back was a remarkably fine achievement, in which she showed both a fine endurance and also a navigational skill of very high order

circumstances to trap the pioneer on such an exploit. But this woman pilot "got through," and on May 17 reached Croydon to receive a shower of congratulations. Mrs. Eliott-Lynn (who afterwards became Lady Heath) later went to the United States, and it was there that she met with a severe accident while flying an American aeroplane. For some time her life was despaired of, but she recovered, and it indicates her love for the air that she resumed her flying as soon as she was fit again.

A contemporary woman pilot of Mrs. Eliott-Lynn was Lady Bailey, wife of Sir Abe Bailey. She learned to fly with the De Havilland School of Flying in 1926, and in 1928 essayed a flight to the Cape. Using her own D.H. Moth, she took off from Croydon aerodrome with the intention of covering the journey in a series of long "hops." For this purpose her machine was fitted with extra fuel tanks, which, it was calculated, would give her a non-stop duration of ten hours. Crossing Europe successfully, she reached Malta, and then flew on to Cairo, via Tripoli. From the Egyptian capital she passed on to Khartoum and Mongalla. Continuing, she reached Tabora, in Tanganyika, and then misfortune overtook her. She crashed, and crashed so badly that the Moth was completely wrecked.

Nothing daunted, Lady Bailey, who was unhurt, at once sent for another machine. As soon as it was delivered she set off once more, and after sundry adventures reached Cape Town on April 30. In all she had piloted her craft for more than 8,000 miles, which at that time was the longest distance ever flown by a woman.

On September 21 of the same year Lady Bailey commenced a return flight. She was not seeking to set up any records in speed, and chose a new and longer route—one that had never before been taken by an aviator. It took her through the skies of Central Africa, over immense jungles and across the Sahara desert. The hazards of such a flight, even with a multi-engined aeroplane, would be considerable; with a single-engined light plane they were undoubtedly high.

But Lady Bailey went her way on an eventful voyage in which she gallantly overcame the many difficulties that beset her. Even after she reached Le Bourget, Paris, her trip was not easy, for she ran into fog over the English Channel and had to turn back and wait for it to lift before she could terminate



Wide World Photos

HÉLÈNE BOUCHER

Mlle. Hélène Boucher was another notable French airwoman who during her flying career secured a number of records for speed in 1934. She made a number of brilliant flights on a special racing Caudron monoplane. She was the victim of a fatal crash at Guyancourt, near Marseilles, in November, 1934



Keystone

NOVICE WHO 'MADE GOOD'

The Hon. Mrs. Victor Bruce was a complete novice at flying when she set off on September 25, 1930, in her Blackburn "Bluebird" on a trip to China and Japan. That she arrived safely speaks well for her skill and the reliability of her machine. She is seen here in the cockpit of her "Bluebird," a small biplane powered with a 120 h.p. D.H. "Gipsy" engine

her long and arduous 10,000 miles journey. That was on January 16, 1929.

Fourteen months after Lady Bailey's Africa-England flight had ended, Amy Johnson, then an unknown girl pilot, took off on what was to prove one of the greatest flights ever made by an airwoman. Her solo achievement, in which she journeyed from Croydon to Port Darwin in 19 days, made her a national heroine, and her story, which is told in pages 669–73, is a stirring one.

In 1930 yet another British airwoman came into prominence. This was Mrs. Victor Bruce, who had already distinguished herself as a motor driver in long-distance trials. From the start of her flying career she was inspired with an ambition to carry out a great flight, and it is a remarkable fact that, within a few weeks of obtaining her pilot's licence, she set off on a journey to China, flying alone in her Blackburn Bluebird.

Leaving Hanworth aerodrome on September 25, 1930, she flew with remarkable skill in a series of long "hops," and, save for a minor mishap at Jask, on the Indian border, made excellent time until she reached Osaka, in the Japanese island of Honshiu. Mrs. Bruce then continued her journey to the United States by steamship, and on landing took her Bluebird off again, flying eastward. After a leisurely trip across the American continent she returned to England, where she was met at Lympne aerodrome by a party of other airwomen. Altogether she had flown 19,000 miles and had made, during her voyage, the first solo flight from Britain to Japan.

The air route from Britain to Australia that has seen so many epic flights was to be traversed by a particularly gallant girl flyer in 1934 in the person of Miss Jean Batten. Coming to England from New Zealand in 1929 to study music, she became interested in flying and joined the London Aeroplane Club, where she showed early promise. In 1933, fired by the triumphs of other amateur pilots, Miss Batten took off in her D.H. Moth on an attempt to reach the Antipodes. She crashed and returned to England. Then, early in the following year, she tried again. Once more she failed.

But on May 8, 1934, Miss Batten made one more effort, and on this occasion she was successful. Day after day she forged ahead, and her progress, as reported in the newspapers, was watched with keen interest. Through the heat and storms of the east she flew on, and on May 23 she reached Port Darwin. She had taken but 15 days to cover that trying route, and the record she had thus established was no fanciful one.

Nearly a year afterwards she essayed a return flight and this, too, was successful, proving beyond all doubt that this slim young girl had stamina, courage and skill that were quite out of the ordinary. That Australia-England flight, made in April, 1935, occupied 17 days 15 hours 15 minutes. Not many months later Jean Batten was again in the news, this time as a conqueror of the South Atlantic (*see* page 425). Using a Percival Gull monoplane, she crossed from West Africa to Brazil in 13¼ hours.

Amongst French airwomen who have made their mark during the decade are Hélène Boucher and Maryse Hilsz. Mlle. Boucher held no fewer than seven world's records in 1934. These she secured with a small, but extremely fast, racing Caudron monoplane. This machine was a low-wing cantilever monoplane of small span and was a



Wide World Photos

THIRD TIME LUCKY

Miss Jean Batten made three attempts to reach Australia from England. Twice she failed, but on the third occasion, in 1934, she succeeded. Above, the girl flyer turns to smile a farewell to an accompanying machine as she leaves Brooklands aerodrome in her D.H. "Gipsy Moth." Below (right), Miss Batten speaks through a microphone to the applauding crowds after her safe arrival at Sydney



single-seater. The engine was a six-cylinder-in-line air-cooled Renault of 370 h.p. It had a retractable under-carriage and a Ratier variable-pitch propeller. Extremely speedy and highly sensitive it was an aeroplane which could be safely handled only by an expert pilot, and before Hélène Boucher flew it only the chief test-pilot of the Caudron Company, Raymond Delmotte, and one other pilot had flown it.

Her handling of this speedy craft was most spectacular, and in a series of officially observed flights at Istres aerodrome, near Marseilles, she flew at more than 276 m.p.h. Her triumph, however, was short, for she was killed soon afterwards in a terrible crash. France recognized her as a truly gallant woman and she was awarded post-humously the Legion of Honour, and many of her countrymen and women paid their respects to her as she lay in state in the Invalides, Paris.

In Maryse Hilsz we find the French counterpart of our own Amy Johnson, for she gained fame as a long-distance pilot of exceptional skill. One of her finest achievements was her journey in April, 1933, from Le Bourget, Paris, to Tokyo in a Titan-engined Farman "290" monoplane. That flight occupied only 5 days 20 hours. Then, on April 23, 1933, just a week after her descent at the Japanese capital, Mlle. Hilsz started her return flight, which she finished safely on May 14.

By her magnificent performance, this French airwoman had proved conclusively, amongst other things, her ability to pilot a big and powerful aeroplane. And in 1934 she made another fine flight from Le Bourget to Tokyo, this time in a military type of aircraft, a 500 h.p. Breguet "27."

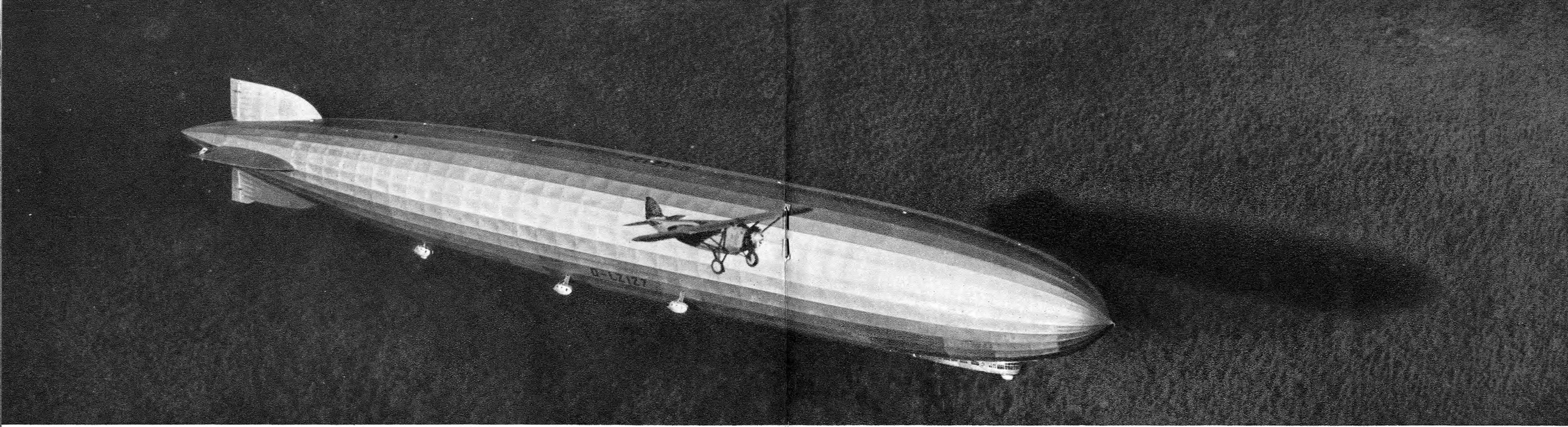
A year later, on June 17, 1935, Mlle. Hilsz broke into another sphere of aviation, by making an astonishing high-altitude flight. Using a single-seater Morane-Saulnier monoplane, with 600 h.p. engine, she gained another record by climbing to over 33,000 feet.

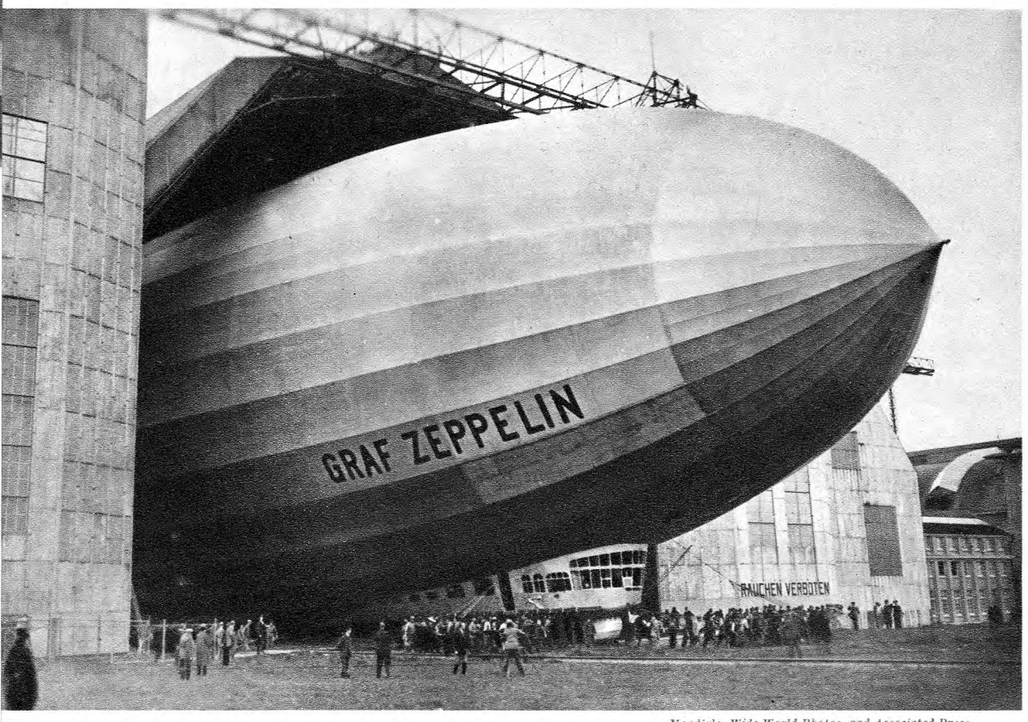


Central Art Library

PERSEVERANCE REWARDED

Miss Jean Batten, the New Zealand girl, of whom we reproduce a camera study by Kay Vaughan, triumphed over early disappointment until today she stands in the front rank of the world's airwomen. In 1934, after two attempts, she reached Australia in 14 days, flew back the following year, and later set the seal on her fame by a record-breaking flight over the S. Atlantic

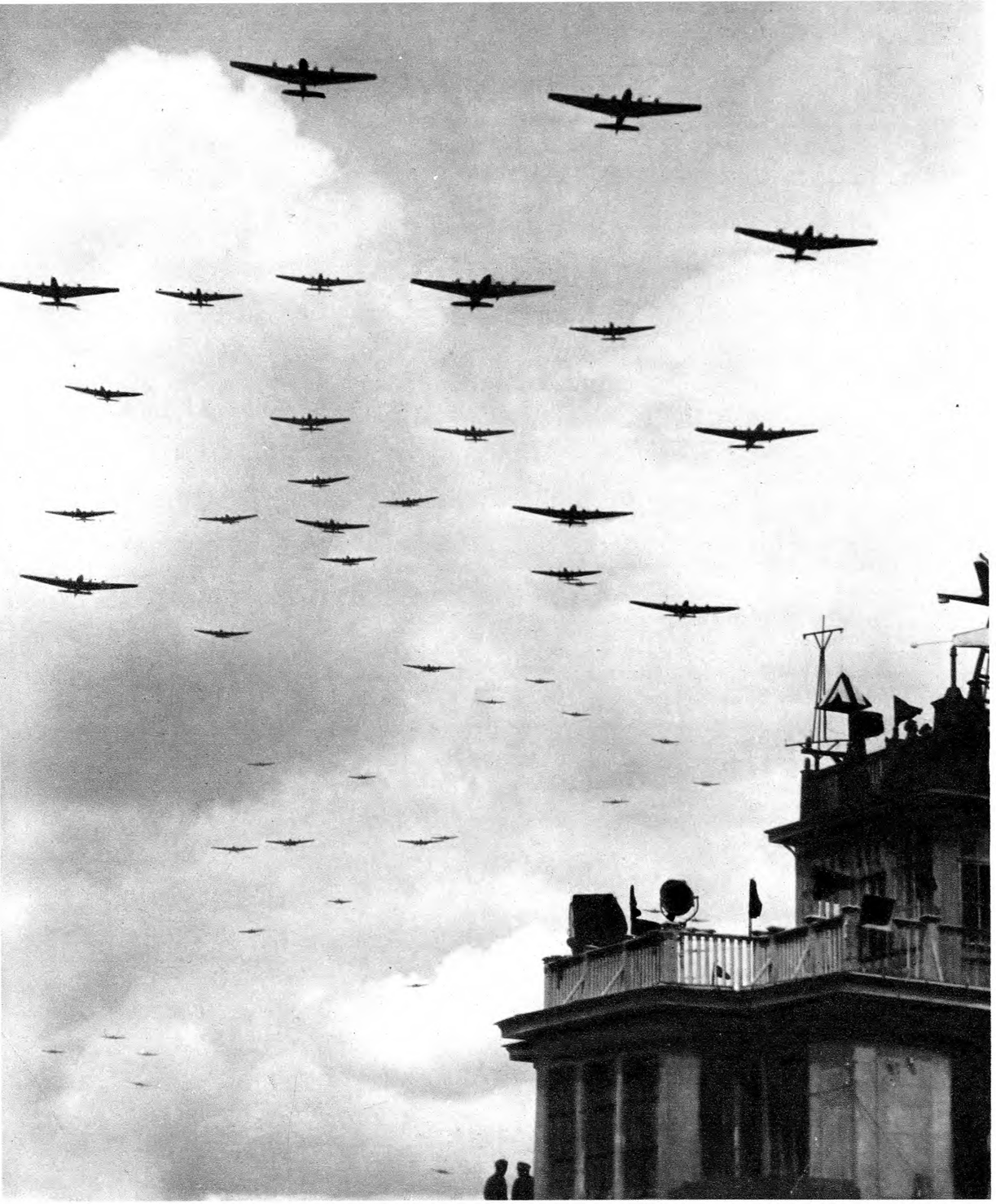




Mondiale, Wide World Photos, and Associated Press

SHIP OF UNSURPASSED RECORD

The Graf Zeppelin supplies the most complete answer to those critics who maintain that the dirigible is a failure and cannot compete with the aeroplane as a commercial craft. From the time of her first trials in 1928 the famous German airship has been consistently successful in long and regular flights across the Atlantic, and to distant parts of the world. In these three photographs she is seen at various stages of her world flight in 1929. Left, the Graf Zeppelin emerging from her shed at Friedrichshafen. In the top photograph the airship is seen flying over Lakehurst, with an American aeroplane passing near to give a mid-air welcome. Right, the German giant cruising over Philadelphia



Planet News

THE MOSCOW SKY ON MAY DAY

This photograph, taken on May Day, 1933, shows a huge armada of giant four-engined bombers of the Soviet Air Fleet leaving Moscow aerodrome to take part in the celebrations, centred in the Red Square. Such mass bombing power forms the backbone of Russia's air strength

Aerial Armadas in Being. 9

RED RUSSIA'S FLYING FLEET

By Major Oliver Stewart, M.C., A.F.C.

Ancient literature contains several stories of soldiers being succoured in battle by reinforcements from the sky. Major Stewart, in addition to much other fascinating information about the air forces that the Soviet is creating, tells how they are preparing, by the use of parachutes, to translate legend into reality in a manner that has impressed the military authorities of other nations

RUSSIA is the country of mysteries, and there is no greater mystery and none more anxiously discussed by the Governments of other countries throughout the world than the strength and equipment of the Red air fleet. Information comes through in vague bits and pieces—at one moment indicating that sensational advances have been made in the quality and quantity of the equipment, and at the next suggesting that the Russians are still lagging far behind other countries in their treatment of aircraft.

A special study which I made a short time ago of the information which had reached Britain about the Red air fleet leads me to conclude that it is not at the moment well equipped or capable of complex tactical manoeuvres, but that it is already of fairly large size and that technical progress is undoubtedly being made at an increasing pace. Moreover, one finds great boldness of thought expressed in some of the activities of the Red air fleet, an instance being the use made of parachutes. (See page 504.)

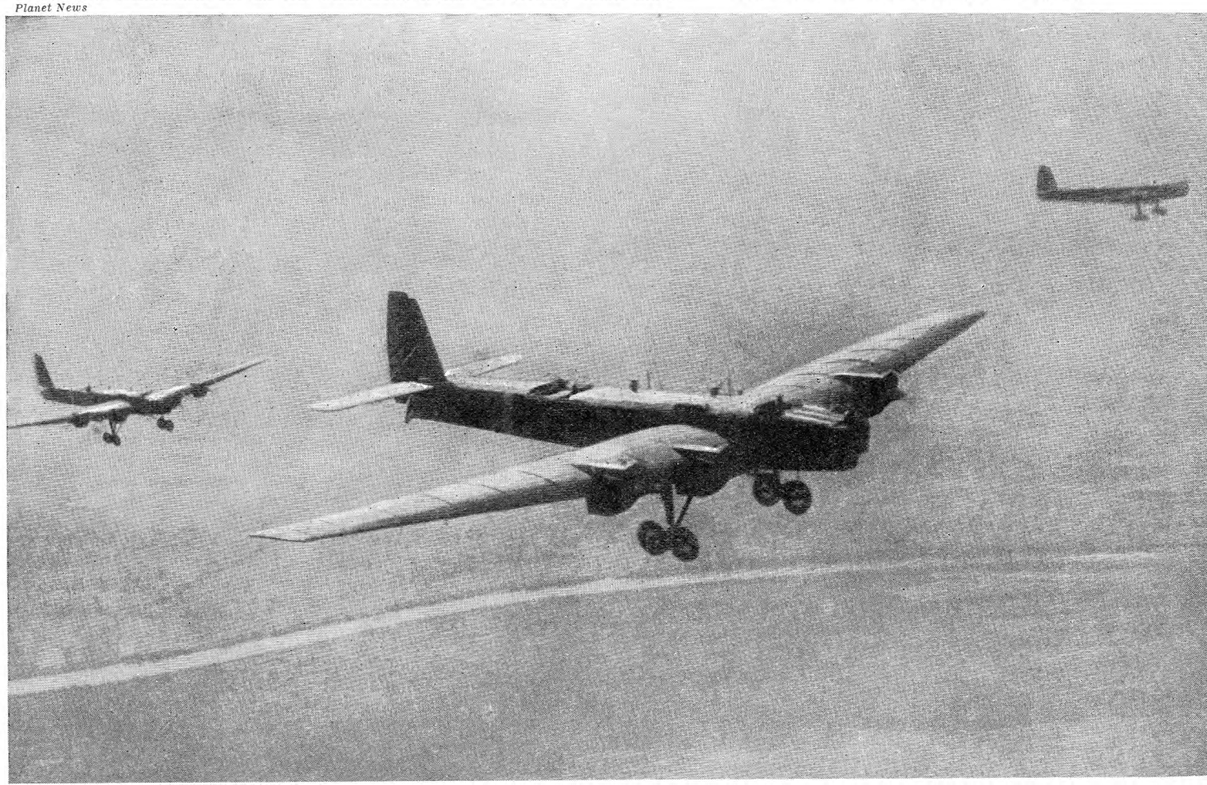
The Russians are the first people to conceive of the parachute as a tactical instrument, a means of landing soldiers with their arms at the point where they are needed in quantity, no matter how inaccessible from the ground that point may be. At first this idea of raining soldiers from the skies by means of mass parachute descents was frankly ridiculed by the air officers of other countries. It was said to be typically Russian, totally impracticable, and so on. But since then the Russians have succeeded in making mass parachute descents on an extremely large scale, and a change has come in the way other countries regard these experiments.

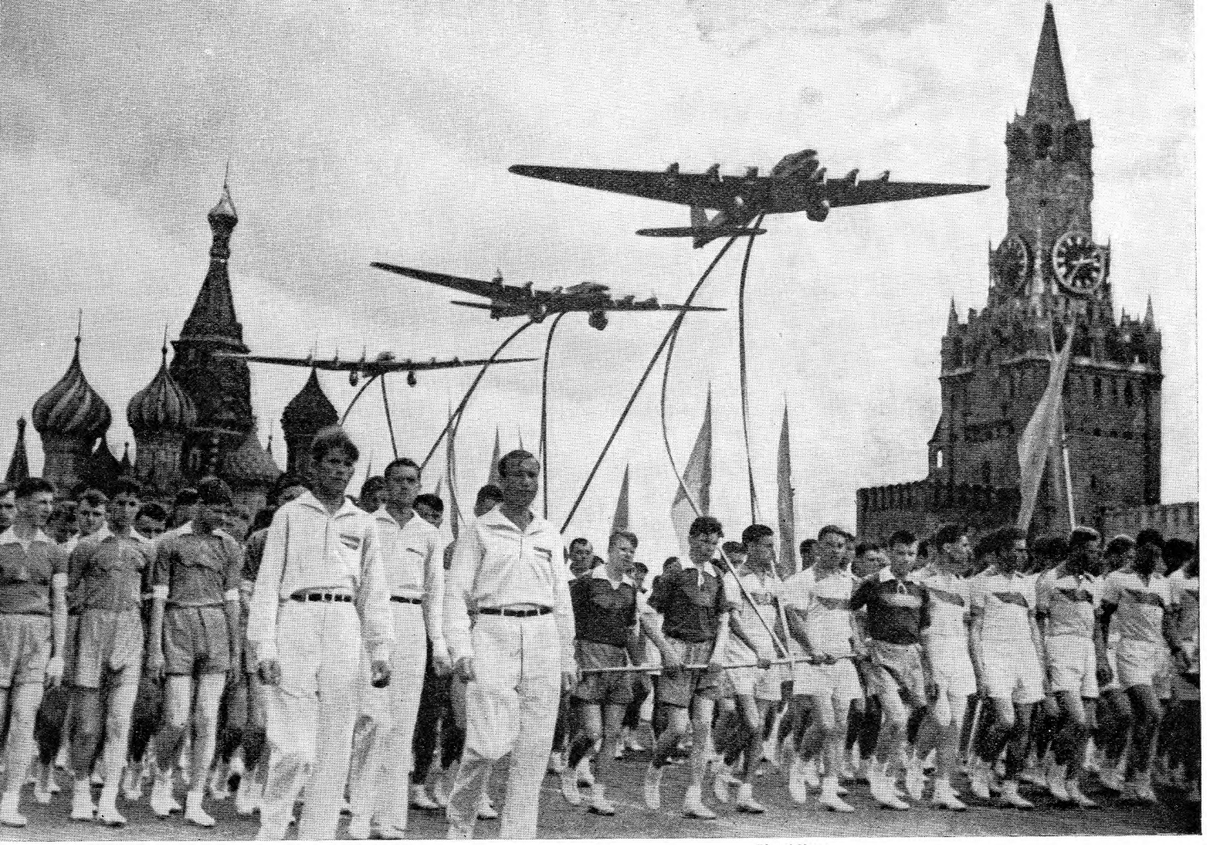
In the war of 1914 almost every sort of tactics was tried in one form or another. Parachutes were used by both sides for the dropping of spies behind the lines, but I know of no instance of the dropping of fighting men. Nor do I know of any insuperable obstacle to dropping a platoon, or even a battalion, of armed soldiers, and to keeping them victualled from the air. Columns of British troops have been fed from the air by British aeroplanes on more than one occasion and something of the same kind was done by the Italians in Abyssinia in 1935–36. So the tactical possibilities of raining soldiers from the skies are not to be scoffed at too hastily, and in any event the fact that the Russians have developed it shows

MASS-PRODUCED BOMBERS

The heavy bombers of the Red Air Fleet illustrated below are products of the great State factories of the Soviet in which the A.N.T. designs (which also include the "Maxim Gorky") and other types are manufactured. These monoplanes are of modern all-metal cantilever construction, but the four water-cooled engines are probably rather heavy

Planet News





Planet News

SYMBOLS OF PROPAGANDA

These youths of the Central Aero-hydrodynamic Institute at Moscow are carrying models of the fleet of giant six-engined monoplanes which the Soviet planned to build. This decision was made despite the disastrous crash of the "Maxim Gorky," which was the largest landplane in the world. The new machines were to be similar except that they would have six instead of eight engines, though of greater horse-power

how receptive they are to the new idea. Even the basic principle upon which the Russian air force is founded seems to be different from that accepted by other air forces. It is clear that Russia believes that air power is exerted by vast masses of aeroplanes, and by the ability to produce them at a rate greater than that of any possible opponent, rather than by the intrinsic quality of those aeroplanes. At the central institute of aerodynamics a design is produced. It is planned for series production on an immense scale, and then the machine is turned out in quantity. To replace it by other machines of superior performance is not of great moment, according to the Russian theory. The essential thing is to fill the sky with machines and conquer all opposition by sheer numbers.

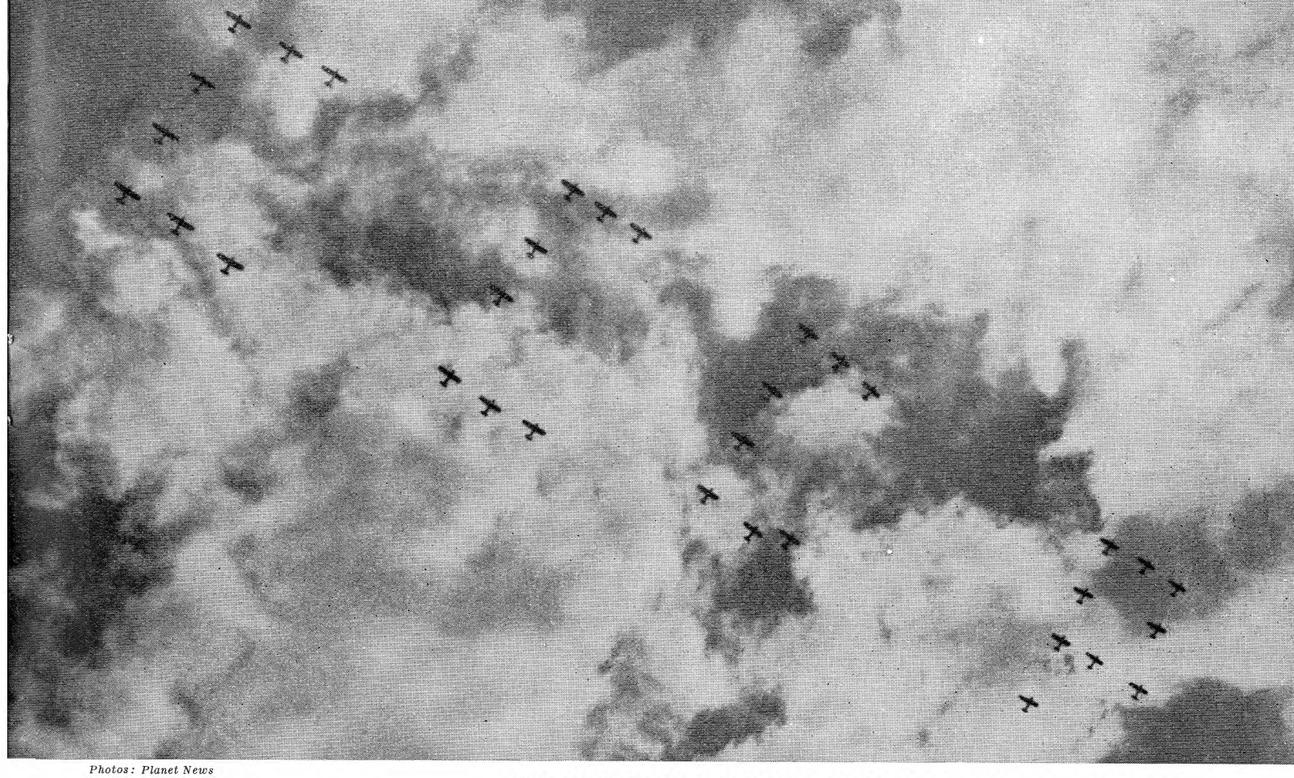
It is a bold conception of air warfare, but one which meets with little agreement among the military and naval officers who have had actual experience of air warfare. Yet progress was made on those lines during the period of the first Five-Year Plan and during the part that has already expired of the second Five-Year Plan. The object at first was to build up the Russian aircraft manufacturing plants under a staff of experts, mainly from foreign countries. Both bombers and fighting aeroplanes were built during the first Five-Year Plan, the total being probably about 500 to 600 landplanes and about 400 seaplanes.

At the close of the Five-Year Plan the Soviet Government, according to statements made in the House of Commons, had about 1,500 aeroplanes. The objective of the Russian Government after that was to reach a total of 8,000 first line aeroplanes, and it is towards that total that they are now working. The present figure is about 2,000 aeroplanes, or possibly rather more. The speeds of the Soviet machines range between 130 and 200 m.p.h. Some of the bombers can carry a load of nearly one ton about 1,500 miles.

In organization the Red air fleet is under a central administration under which are the heads of the various departments of military aviation. The executive units are squadrons, brigades and patrols, a patrol having, apparently, the function of a British flight of three aeroplanes.

The various branches of scientific work come all under one department, and so do training and navigation. Engines are as yet mainly of foreign design, the British Bristol being among them; but the Russians are making headway in original design and should soon be producing complete aeroplanes with engines of their own design.

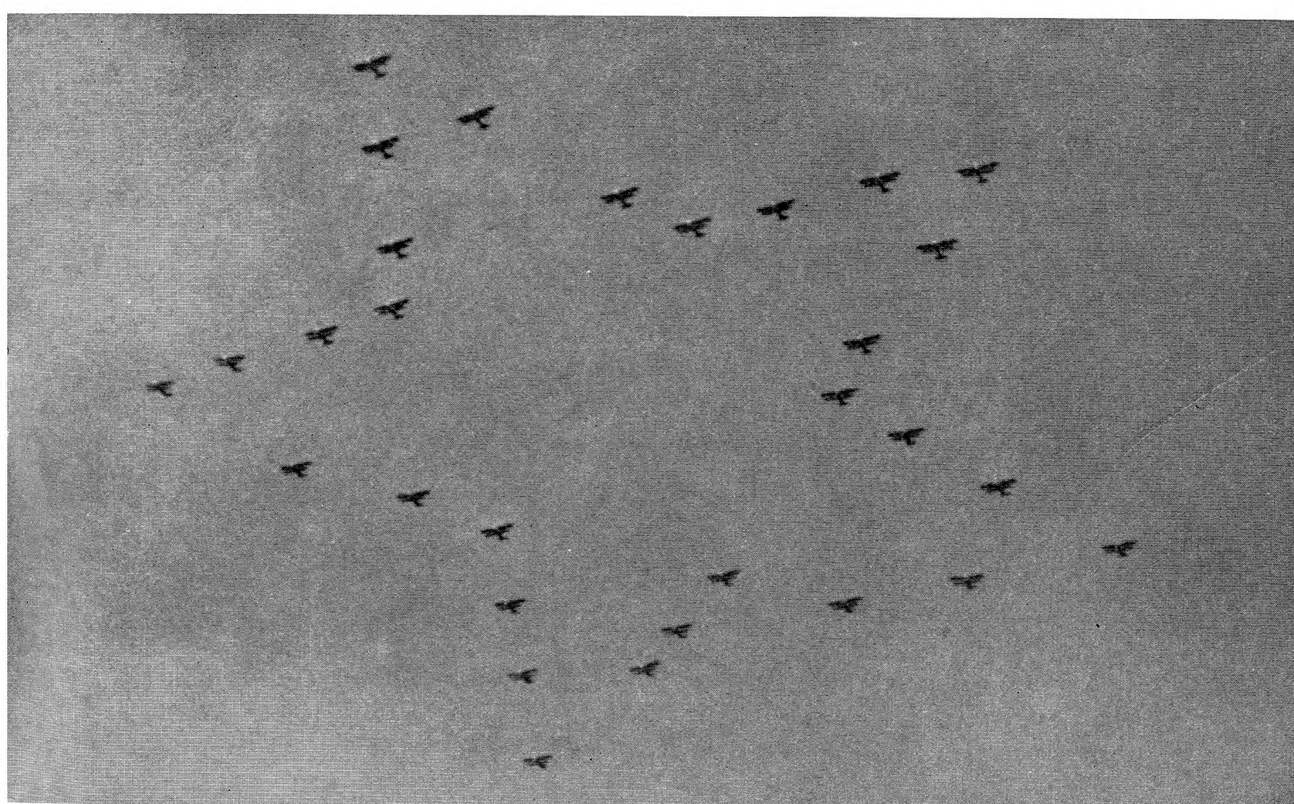
One of the things which must strike anyone who examines the machines of the Red air fleet is that the bombers predominate to a greater extent than in the air forces of other countries. The Royal Air Force, for instance, has paid great attention to the development of the single-seater interceptor fighter, which is essentially a defensive weapon and which could not be used effectively for attack against ground targets. But the Red air fleet does not, it seems, believe in single-seater fighters of any kind. It places its faith mainly in the large bombers. In this attitude the Russians conform to the theory that against aerial bombing attack there is



Photos: Planet News

PATRIOTIC FORMATIONS PRACTISED BY SOVIET AIRMEN

That Russia's formation flying is of no mean quality—and quantity—is shown by these patterns traced in the sky. Above, a fleet of small machines forming the letters C.C.C.P., the Russian equivalent of U.S.S.R. (Union of Socialist Soviet Republics) at a Moscow air parade. Even more difficult is the five-pointed star illustrated below, part of the national insignia of the country

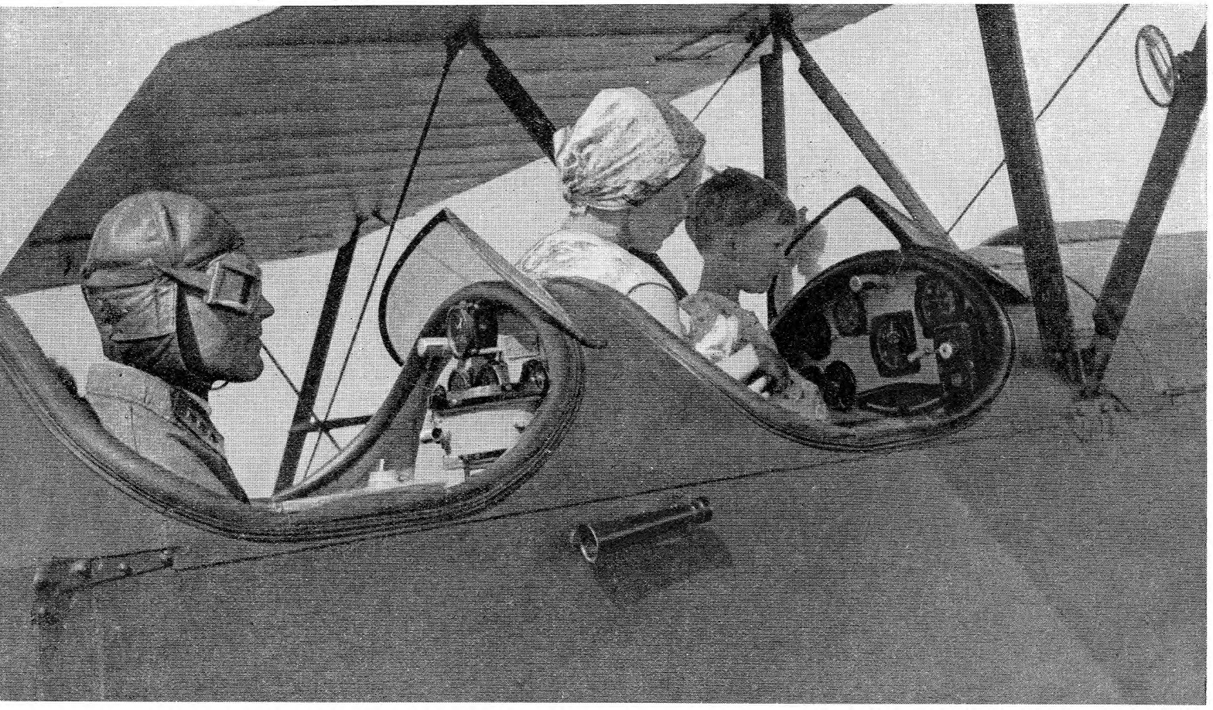




Photos: Planet News

UNIVERSAL AIR EDUCATION

Air power is one of the primary aims of the new Five-Year Plan, and every citizen of the Soviet is expected to have some sort of practical air knowledge. Parachuting enjoys great popularity, and parades of young parachutists are common. The photograph above was taken at the Tushin aerodrome, on the occasion of a parachutists' festival. Below, a mother and child being taken for a free flight on the 1934 "day of rest" as a reward for efficient work. "Airmindedness" is largely instilled by the Osoaviakhim (Society for Aerial and Chemical Defence)

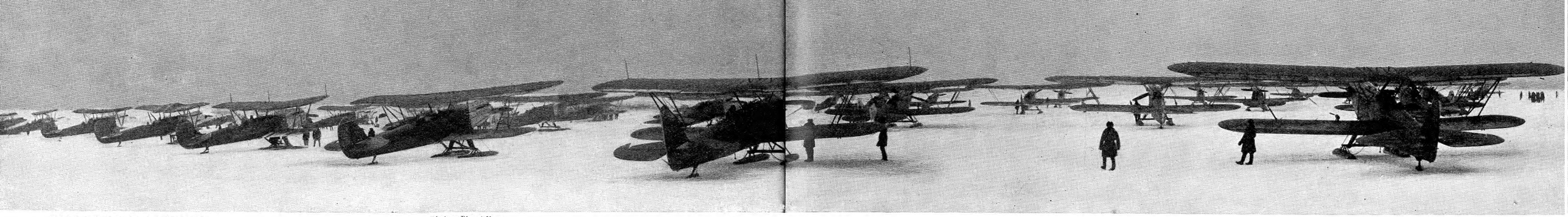




Planet News

WARLIKE 'CELEBRATIONS'

This photograph was taken on the same occasion (May Day, 1933) as that in page 726. It shows the scene in the forbidding-looking Red Square in Moscow, with lorry-loads of soldiers in the foreground, and part of the great air bombing fleet disappearing in the distance after flying low over a temporary monument erected to the workers



Photos: Planet News

DISPLAY BY HEROES

Russia is so vast that the aeroplane is a valuable means of patrolling the more remote regions. The heroic rescue of the crew of the "Chelyuskin" (see pages 157–61) was accomplished by Russian airmen, here seen about to give a display after their safe return

no real and adequate defence; there is only counter-attack.

Although it was not a military type, the A.N.T.20 must be mentioned here because it illustrated the progress made in design and operation in Russia. The A.N.T. 20, known as the Maxim Gorky, was completed in 1934 and was the largest landplane in the world. The machine had eight 750 h.p. engines, two of them being mounted in tandem over the fuselage. Monoplane design was used, and the wing-span was 206 ft. 7 ins. The loaded weight was 92,400 lb. and the maximum permissible loaded weight was 116,600 lb. This machine is described in pages 476-8.

This machine was flown successfully, and then, in 1935, when it was being flown with a full complement of passengers on board, it came into collision with a light aeroplane which was said to have been doing aerobatics. The machine crashed with heavy loss of life. But that the Russians were not deterred by this is shown by their decision, announced immediately afterwards, to build eight further machines of similar, though rather larger, type.

Recent information suggests that the Red air fleet has behind it a well-planned expansion scheme, and that special attention is devoted by the higher command to factory facilities and to the methods of turning out large numbers of aeroplanes at the highest possible speed. It has been clearly demonstrated that the larger the machine the more important is it that the production planning should be quite satisfactory.



CLIMBING OVER CAUCASIAN MOUNTAINS

The responsibilities of the Soviet Air Fleet cover not only the Arctic North, but also the natural frontiers of the Ural and the Caucasus. In this photograph we see aircraft of the U2 biplane type—part of the 2nd "Alpiniade" division—flying low in the Baksan ravine, near the extinct volcano, Mt. Elbruz, in the Caucasus range. This is the traditional resting-place of the Ark

With small machines, such as fighters, it is possible to turn out many different types and yet to get sufficient quantities; but with machines such as heavy bombers, of all-metal construction, where the jigs and tools for production cost many thousands of pounds and where complete rooms are filled with the paper work which is the mainspring of the process of manufacture, only a few types can be selected if there is to be an adequate capacity for expansion. Consequently, the degree of standardization in military aeroplanes increases with increase in size, and this is a point which the Russians seem to have seized upon, with the result that their bombers, though they may fall behind others in performance, they can probably be manufactured much more rapidly.

A good deal has been spoken and written about the menace of the Red air fleet. At the moment it can hardly be said that that fleet constitutes a menace, because it is, on the whole, too far behind other fleets against which it would have to be pitted, to stand much chance of success. But it is unquestionable that it is advancing rapidly in size and in technique. It does not comform to the British ideas of the ideal air force, but it is, none the less, capable of doing military work.

In the Russian personnel there has been improvement. Standards of training have risen. When Russian pilots were being trained in England some years ago they did not show much aptitude for flying, on the average.



'SWITCH OFF—SUCK IN'

The youth of Russia has eagerly taken up aviation in all its branches, for which it receives every encouragement. This girl enthusiast is swinging the propeller of the Le Rhone rotary engine fitted to an old British Avro training plane

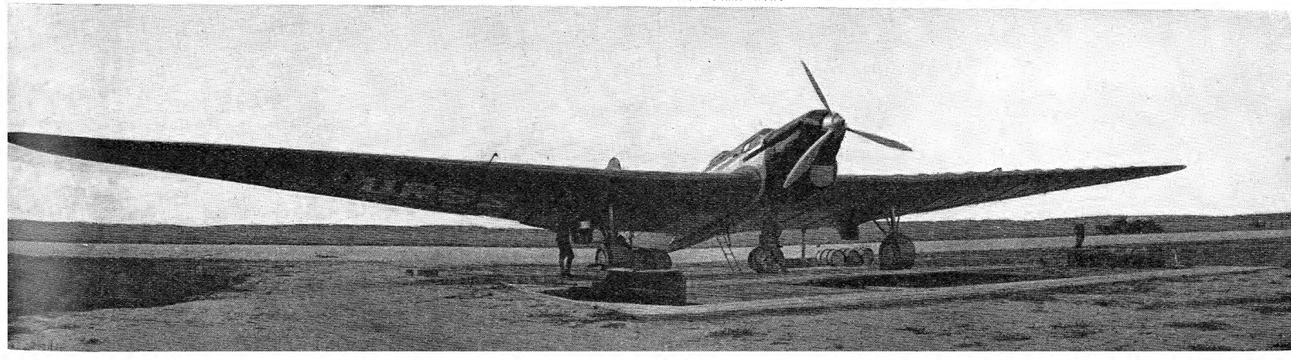
But today it seems that the average has been improved, and that Russia could rely upon being served by large numbers of pilots of reasonable skill.

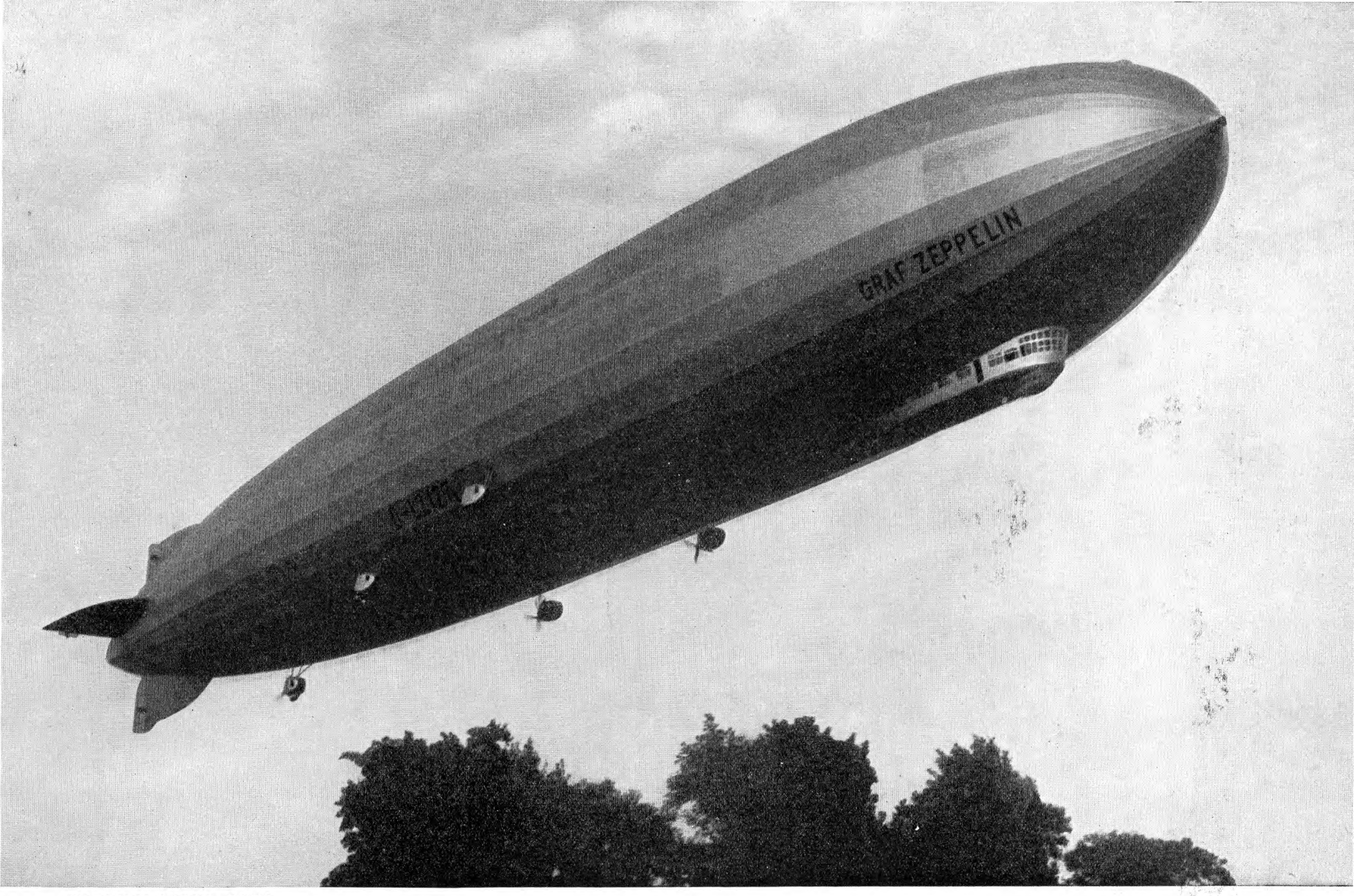
Flying instruction based on the systems in operation in other countries is being steadily extended. There appears to be an intensive propaganda on foot, too, for the encouragement of airmindedness amongst the young men and women, and, like Germany, the Soviets attach considerable importance to the development of motorless flight. Some of the reports of experiments that have been carried out from time to time with gliders and sailplanes appear fantastic from the British point of view. Nevertheless, they show that there exists to-day a very live interest both in aeronautical science and in aircraft development in the U.S.S.R.

LONG-RANGE DESIGN

The most striking thing about this aeroplane is the immense span of the monoplane wing. This feature is common to most long-range aeroplanes, and this machine was actually built for a non-stop flight from Moscow to San Francisco in 1935. The pilot, Levanevski, abandoned the attempt in Siberia, however

Photos: Planet News





ENGLISH VISIT, 1931

Great interest was taken in the Graf Zeppelin when she arrived at Hanworth, Middlesex, on a demonstration flight from Germany in August, 1931. Huge crowds collected at the aerodrome to watch her arrival and departure, and the ease with which her crew handled the big craft caused a deep impression amongst onlookers. In this striking photograph the airship is seen flying low on the outskirts of the aerodrome just before making her landing

Airships: Triumph and Tragedy. 7

FEATS OF THE GRAF ZEPPELIN

By Capt. J. A. Sinclair

The tragedy of the airship has been described in several chapters in this series, but in the present case Captain Sinclair is able to tell a tale of unqualified success in this field of human endeavour. He records the flights of the Graf Zeppelin, to which he adds some details about the newer German airship, LZ129, known as the Hindenburg

THE successful record of Germany's commercial airships covers a period of twenty-five years. Between 1910 and August, 1914, airships operating in Germany carried 37,250 passengers, made 1,600 flights and covered 90,000 miles in 3,200 flying hours, without injury or mishap to a single passenger. Then came the War and commercial operation ceased.

In August, 1919, the Bodensee, Germany's first post-War commercial airship, took the air. From August 24 to December 1, 1919—that is, 98 days—she made 103 flights. But at this stage the Inter-Allied control commission stepped in and ordered the Bodensee to be delivered to Italy, and her sister ship, the Nordstern, then just completed, to France. Commercial airship development was thus stopped in Germany for seven years. However, Dr. Hugo Eckener, and those who worked with him, could not be expected to allow the valuable experience gained to be lost to their country. So they struggled on, and, in spite of financial difficulties and other obstacles, built the Graf Zeppelin, which was launched in 1928.

This gigantic ship has proved the complete practicability of a transatlantic commercial air service. Under the most stringent climatic conditions, encountering every conceivable kind of weather and navigating difficulties, she has shown her airworthiness and structural strength. Her trips to the Arctic and the tropics, and her cruise round the world, carrying freight, mail and 61 people, remain outstanding events in the history of air travel.

The Graf's first flight across the Atlantic to Lakehurst, New Jersey, took 111 hours 46 minutes. A damaged fin over Bermuda delayed the ship for 24 hours. Repairs were carried out in flight, a thing quite impossible with heavier-than-air machines. In May of the following year (1929) she again set out for a second crossing of the Atlantic, but engine trouble compelled her to turn back, and she landed at Toulon with only one motor out of five running. The airship, with four-fifths of her motor power gone, then turned back to port and there she landed without damage.



G.P.A.

ECKENER OF THE 'GRAF'

Dr. Hugo Eckener, seen here in a characteristic photograph, ranks as the world's greatest authority on lighter-than-air craft. Associated with Count von Zeppelin in 1900, he was actively engaged in the design, construction and flying of airships for more than thirty years. As commander of the Graf Zeppelin on its many long voyages, he is now a world-famous figure

In the early dawn, at 4.30 a.m. on August 15, 1929, the Graf Zeppelin rose from the ground at Friedrichshafen and, pointing her nose on a northerly course, commenced the first passenger and mail flight round the world. About 6½ hours after her departure Berlin passed rapidly under the ship. Stettin, Danzig and the Baltic Sea followed, and at 7.45 that first evening the airship crossed the Russian frontier ten miles south of Dünaberg.

On the evening of the 16th the Graf Zeppelin passed over Wölogda, and later the Ural Mountains were sighted directly ahead, stretching across the airship's course. They were crossed at a height of 4,000 feet, and then began a procession of lakes, rivers and swamps, extending almost to the Pacific. When this coastline was crossed at the town of Ayan the most difficult part of the world cruise had been left behind.

In the Gulf of Tartary a typhoon was encountered and the airship passed through repeated rain squalls with strong winds, and four days after the start she landed at Kasumigaura, near Tokyo, having covered 7,030 miles in 101 hours 49 minutes. Three-fourths of the time the ship had flown with only four motors, and ample petrol and oil remained on board to take her non-stop to Los Angeles; but Japan had to be visited on political grounds. At 3 p.m. on August 23 the ship again took the air, heading on an east-south-easterly course across the vast Pacific ocean.

Soon the unmistakable signs of another typhoon could be seen ahead. The setting was as dramatic as could be imagined. Lightning flashed close



Associated Press

SHADOW OF A GIANT

This remarkable photograph was taken by a passenger from the cabin of the Graf Zeppelin as she was flying just off the Brazilian coast during one of her numerous transatlantic flights. As the dirigible pursues her tranquil course, her shadow moves over the restless surface of the ocean. Note the small boat amid the breakers in the centre of the photograph

aboard, and sharp gusts slapped the ship. For the second time on this remarkable voyage the Graf Zeppelin safely weathered a storm. On her third day out the airship spoke to the first steamer that had come into sight on the Pacific. This was the Japanese vessel Hakutatsu Maru, and as the airship had been, for almost 30 hours of her crossing, flying through fog, her position was checked with that of the steamer. Their positions agreed.

In 66 hours 45 minutes after leaving Japan the Graf Zeppelin landed at Los Angeles. That same night, after refuelling, she left Los Angeles on the third stage of her voyage. It was at this departure that those on board had their most thrilling experience. During the day, while the ship was moored on the ground, strong sunshine had overheated the gas. At sunset this abnormal temperature fell; in fact, there was a subnormal temperature. The consequence was that the ship became much heavier and the take-off was made very difficult.

The airship at first rose, and then, because of a strong "inversion," lost height. Four engines went full speed ahead, with elevator up, to depress the tail and elevate the bow, so that the ship would climb. She was so low that the climbing angle put the tail on the ground, causing the lower rudder to drag a few feet, and, under the increasing speed, the ship leaped, then settled, struck and dragged again, leaving a deep furrow. The speed increased. Around the flying field ran high-tension wires suspended from poles, each pole marked by a brilliant but forbidding red light. The Graf Zeppelin raced towards these wires at ever-increasing speed.

It is impossible to describe the feelings of those on board. Now, more than ever, their lives and the safety of the ship depended upon the unerring judgement and calm courage of one man, Dr. Eckener. The forward car cleared the wires by a few feet, but the ship was then at an angle of 10 to 12 degrees, and her tail 700 feet astern, so that this part of her was still some vertical distance below the death-dealing wires. The people on the landing ground scattered like rabbits. Dr. Eckener nodded, and his son Knut, awaiting this signal, spun the elevator wheel. Down went the bow towards the ground at 50 miles an hour, even though the ship was not so very far from it; but up went the stern. The tail cleared the wires, the controls were reversed and the Graf was safely climbing into the air once more.

At daybreak she passed Yuma, Arizona, a town that proclaims in stony outline on the ground to the air traveller above—"Yuma—Hot as Hell." On August 29, at 6.40 a.m., the Graf Zeppelin circled the Statue of Liberty and half an hour later landed at Lakehurst. After a stay of three days she left Lakehurst under the command of Captain Lehmann, with 63 persons on board, 400 kg. of mail and 400 kg. of cargo. Exactly two and a half days later she crossed the Spanish coastline, and at 8 a.m. on September 4 arrived back at Friedrichshafen. The whole time of the world cruise was 20 days 4 hours 14 minutes. The distance covered was 21,300 miles. Of the whole time, 7 days 5 hours 54 minutes were spent in ports; so that the true journey time was 12 days 12 hours 20 minutes.

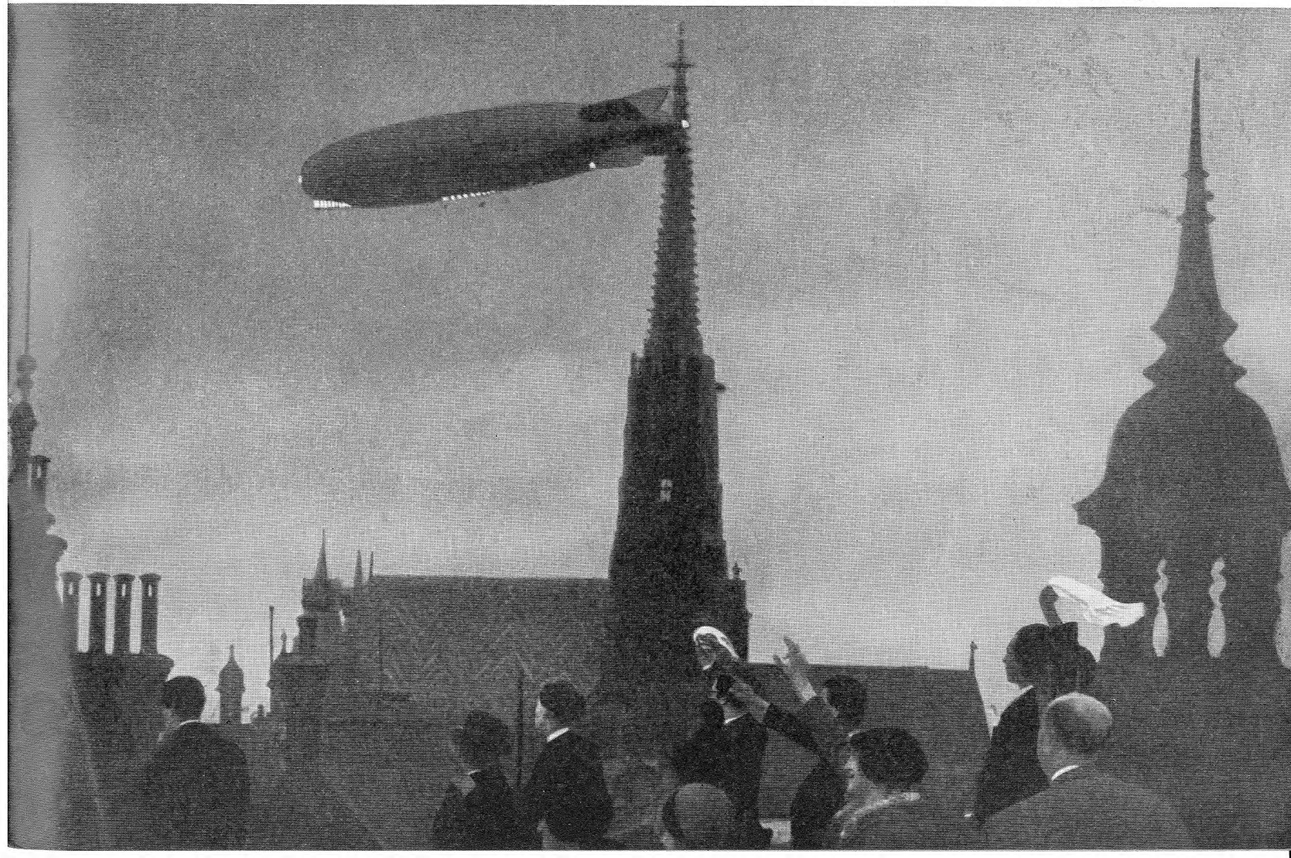
For the benefit of those who have a thirst for speed and who would compare these times and distances with aeroplane achievements, I must remind them that the fast mail plane between London and Brisbane, a distance of 12,000 miles, takes twelve days to cover this. In 1930 the Graf Zeppelin made two minor Atlantic flights, and the following year, after making various trips between Germany and Brazil, she went on long cruises to Egypt, Iceland and the Arctic.

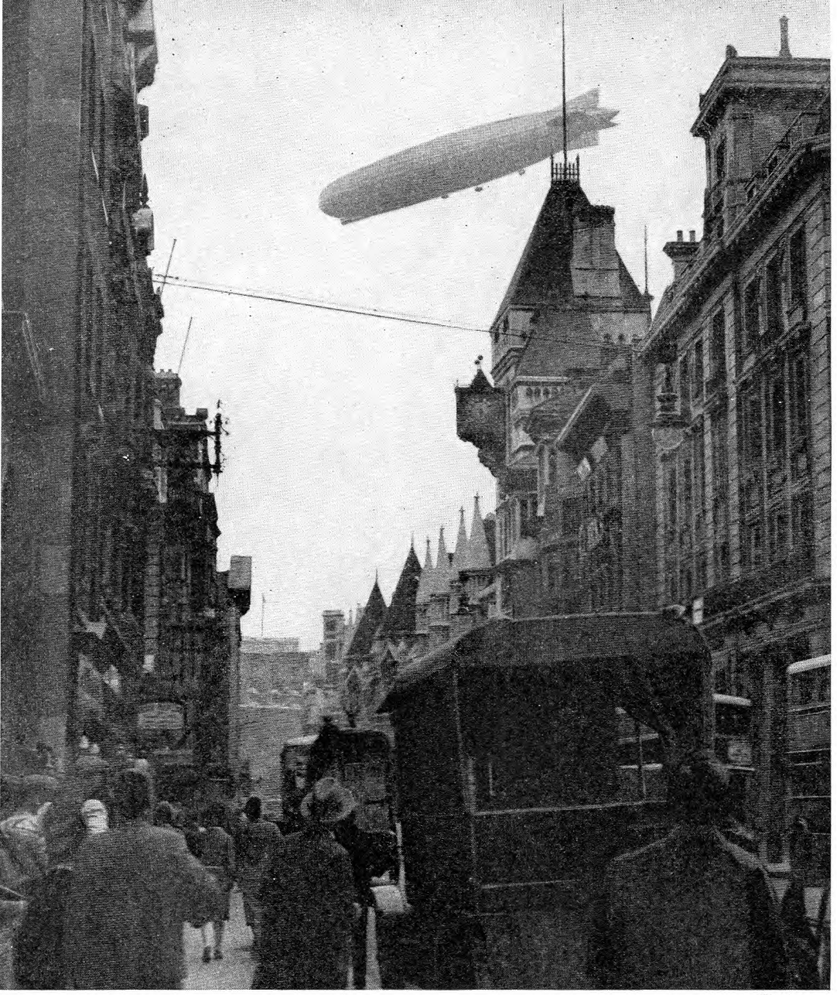


Wide World Photos

EUROPE'S CITIES SEE THE 'GRAF'

Shortly after her completion in 1928, the Graf Zeppelin carried out an extensive tour over Europe, and people of many different nations saw the airship as she passed above city, town and hamlet to the accompaniment of the rhythmic hum of her powerful engines. Above, the dirigible flying over the ancient city of Athens in a cloudy sky. Below, the "Graf," with cabin and navigation lights on, makes a fine sight as she crosses Vienna in the twilight. In seven years the airship made more than 100 ocean crossings, covered over 900,000 miles and carried over 32,000 passengers





Keystone

'ZEPP' OF PEACE

During her visit in 1931 the Graf Zeppelin cruised over London. To many the sight of the airship revived memories of the War, when her predecessors paid less friendly visits to the metropolis. Here is a photograph taken in Fleet Street as the "Graf" droned overhead. The engine nacelles and control cabin in the bows are clearly seen

Since March, 1932, this airship has run a regular mail, passenger and express service between Friedrichshafen and Rio de Janeiro, rigorously keeping to a predetermined time schedule. As an example of the way the Graf runs to time, there is interest in studying the log details of her flight to the Century of Progress Exposition in Chicago, in October, 1933. According to schedule—which, by the way, was published two months ahead—the Graf Zeppelin, leaving Friedrichshafen on October 14, was due to arrive at Pernambuco on the evening of October 17, and duly arrived at 11.50 p.m. She then made her usual flight between Pernambuco and Rio de Janeiro.

On this particular occasion the aeroplane service between these two places was temporarily suspended on account of bad weather, yet this "very dangerous and unmanageable" type of aircraft kept to its time-table. The passengers suffered no ill effects and were unaware that the ship was passing through a strong gale.

From Brazil the ship took off for Miami, Florida, which she was due to reach on the morning of October 23. The actual time of arrival was 1.25 a.m. on that day. In the next stage of the flight warning was given that the dates could only be approximate on account of technical fuelling problems at Akron, Ohio. To compare the estimates is interesting. Due to arrive at Akron on October 24, the ship landed early on the morning of the 25th, flew to Chicago and back, and started for home from Akron, as arranged, on October 28. Over the Atlantic bad weather was met. The airship steered round it, thus going many miles out of her course. Even so, she arrived at Seville, in Spain, on October 31 instead of October 30, according to schedule.

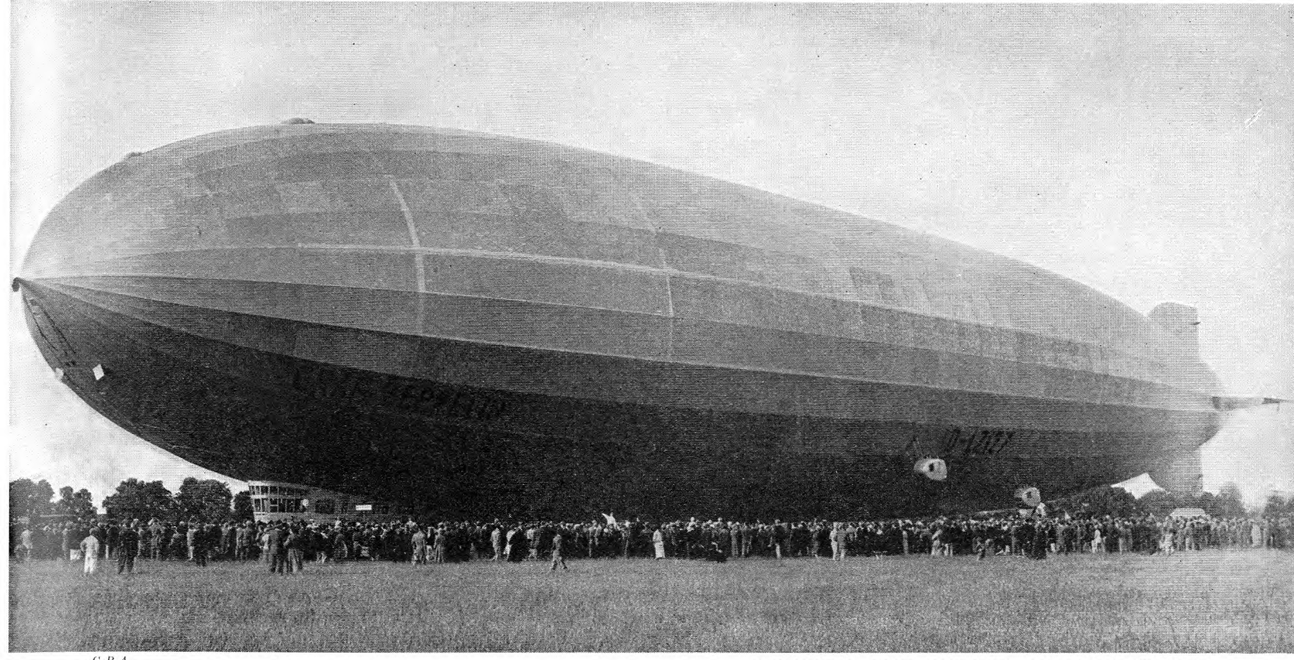
The Graf Zeppelin has now (1936) completed seven years of successful operation and her flights are no longer considered news. In 1935, during the months of November and December, she alone maintained the mail service between Bathurst, West Africa, and South America, the flying boats being unable to carry on owing to the withdrawal of their ocean carriers for a refit.

She has now crossed the ocean 111 times, covered over 900,000 miles and carried over 32,000 people without the slightest accident or injury to her passengers and crew. Her cargo, varied in the extreme and sometimes composed of livestock, wild animals, grand pianos and aeroplanes, has amounted to many tons; while she has also carried a quantity of mail.

In accordance with Germany's expansion scheme the new Zeppelin LZ129 commences operations across the Atlantic in 1936. This airship has a capacity of 7,070,000 cubic ft. and can be inflated with the non-inflammable helium without loss of pay load. This makes her the largest lighter-than-air craft in existence. She is 813 ft. long and has a diameter of 135 ft. The covering of the envelope is doped with aluminium powder to minimize the effect of heat rays. Once covered, her bulk is equalized by the streamlines of her construction, and, although less slender than the Graf Zeppelin, she appears quite proportional. Her gas-bags are not of gold-beater's skin, as hitherto, but of a gelatinoid film material, especially fabricated.

The sixteen gas-bags can be filled with helium, although this may not necessarily be used. In practice, it is possible that helium will be used to inflate the outer gas cells and only the inner cells may contain hydrogen. These would then be protected by the helium cells, and, in case of necessity, the hydrogen could be allowed to escape without any considerable expense. The frame is constructed of longitudinal and transverse girders of duralumin, the whole structure being strengthened with wire, following Zeppelin practice.

She has four 1,000-h.p. engines, each being a unit in itself. These are accessible from lateral gangways, which also serve for storing oil and petrol. These Diesel engines are operated on crude oil stored in the keel in a number of individual containers connected to a distributing system extending the entire length of the ship. The fuel load

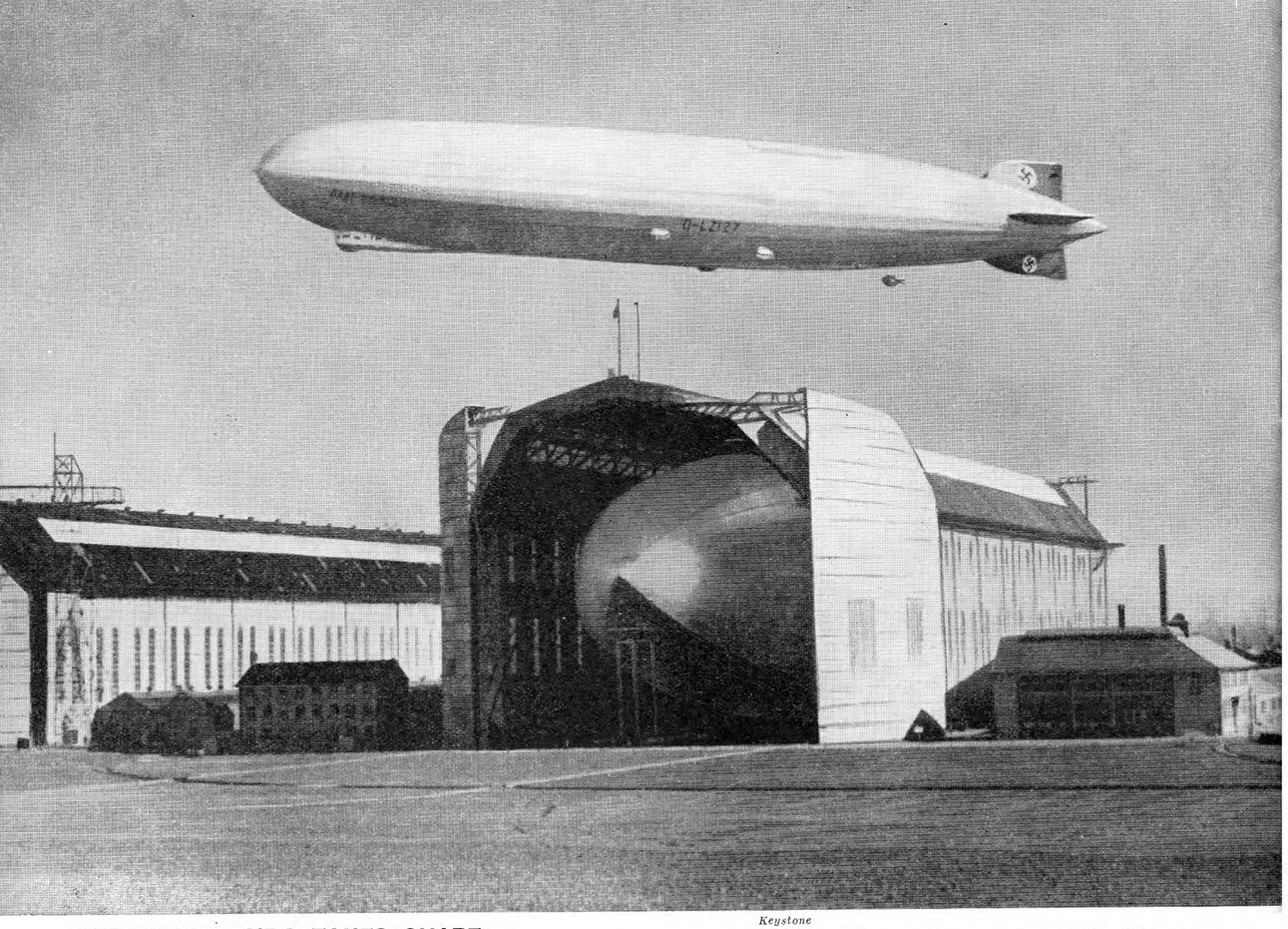


G.P.A.

OUTSIDE AND INSIDE—THE CATWALK

The great size of the Graf Zeppelin is well illustrated in the photograph above, which was taken at Hanworth aerodrome just after the airship had landed in August, 1931. From nose to tail she measures 772 feet, and her maximum diameter is 100 feet. Her five engines, which together yield 2,650 h.p., give her a maximum speed of 80 m.p.h. Below, two of the crew standing in the catwalk that is located in the keel of the airship. The girder framework of the hull, two members of which are seen in the foreground, is of duralumin with wire bracing

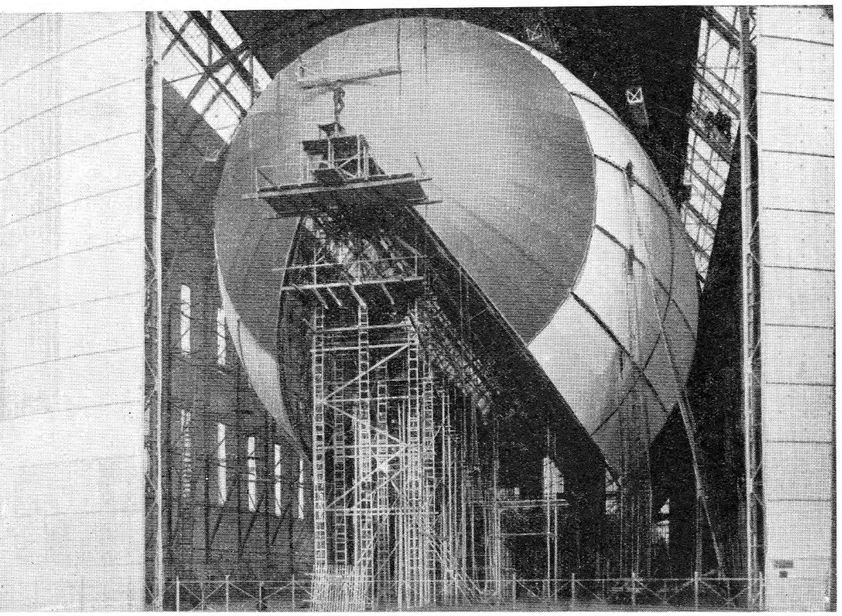




Keystone

THE HINDENBURG TAKES SHAPE

Friedrichshafen has been the home of the Zeppelin throughout its evolution, and both the Graf Zeppelin and the LZ129 were constructed in the works that stand near Lake Constance. Here, in the photograph above, is seen the Graf flying above the famous landing ground, with the new ship just visible within one of the huge sheds. Below, a closer view of the LZ129, later named the Hindenburg, with mechanics busily engaged on the work of covering the hull during the later stages of its construction



amounts to some 140,000 lb. The use of fuel oil is of inestimable value as a safety factor, and will save eight to ten tons of fuel. This airship is able to travel 8,000 miles without refuelling and can maintain a cruising speed of 80 m.p.h. The new ship carries 50 passengers and 20 tons of pay load, in addition to a crew of about 35.

In the bow and under the nose of the main body of the airship is situated the control room. Immediately behind this is a separate room for the navigators, while, inside the hull, and above the control room, is the wireless room.

The passenger accommodation, placed amidships within the hull, is on two decks, and has a total floor space of 5,380 sq. ft. The upper deck contains a dining-room, social hall, writing and reading room, 25 state rooms, with hot and cold water, and 50 beds. A 45-ft. promenade deck runs along each side. On the lower deck are the bath-rooms, quarters for officers and crew, smoking room and kitchens. A hold for cargo is provided amidships. Her first trial flight was made successfully on March 4, 1936.

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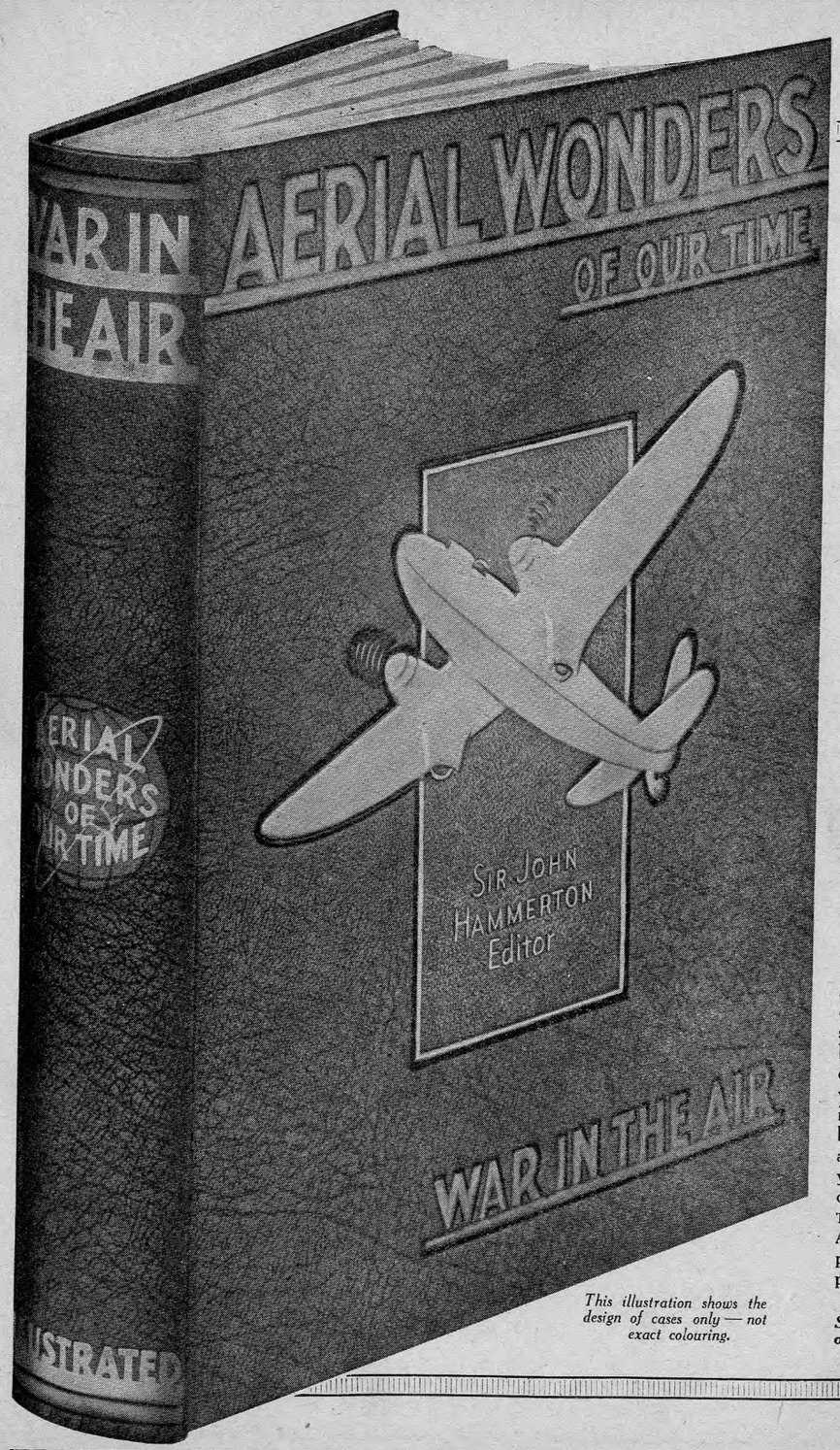

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Part 24 Complete in 25 Weekly Parts **SEVENPENCE**

WAR in the AIR

AERIAL WONDERS OF OUR TIME

SIR JOHN HAMMERTON
Editor



Editorial Eddies

John Carpenter House, London, E.C.4.

MANY readers of WAR IN THE AIR have doubtless seen Part 3 of the *Encyclopedia of Modern Knowledge*, as it has now been on sale for just a week, and it may be that they have formed their own conclusions about it. They will, nevertheless, have no objection to my use of these columns for making some remarks about this particular number and the writers who have contributed to it, while those who have not seen it may like to know something about a work for which many of them, unconsciously it may be, have been waiting. First of all I may say that Part 3 is in no sense exceptional. It can, in fact, be taken as a representative number, neither above nor below the average of this publication, but doing its fair share in carrying out the very comprehensive programme that was sketched on the folder at the beginning of Part 1.

AMONG the arts and sciences the appeal of history is unusually strong, and no fewer than three chapters deal with this subject. Sir Leonard Woolley, whose name is very familiar to readers of my earlier publications, concludes his chapter on Mesopotamia as the Cradle of Civilization, a subject on which he is an unrivalled authority. A remarkably interesting series that begins in this number deals with social life in the Middle Ages, its first chapter being on Medieval Life in the Western Kingdoms. The tendency of historical research today is to move away somewhat from the traditional lines of political history, with its kings and parliaments, wars and treaties, and to lay greater stress upon the social and industrial life of the ordinary people. In this work, and especially in one department of it, Professor A. Hamilton Thompson has been a pioneer, as the long list of books, all of them thoroughly readable, that stand to his credit, prove. We are fortunate, therefore, in securing from him a new survey of this fascinating subject. The third of these chapters is an Outline of the World's Story by Mr. A. D. Innes, whose wide knowledge, combined with a lucid style, make him the ideal writer of a sketch of this kind.

IN modern life a prominent place is filled by art, and two writers deal with branches of this subject. One of them is Mr. A. C. Bossom, M.P. for the Maidstone division of Kent, who writes on New Materials and New Methods in Building. Mr. Bossom has had an unusually wide experience as an architect. He spent something like twenty years in the United States, to which country he went in 1903, and where he held a number of important appointments. He has also been responsible for some of the large planning schemes in that country and he has provided the money for some research lectures on the desirability of introducing new building methods in England. This chapter, whatever else it may be, will not be lacking in sympathy with new ideas. The other chapter is Mr. Eric Newton's account of The Modern Approach to Art, which is the second in the series on the fine arts.

BY way of an introduction to mathematics Professor H. Levy discusses the Limits of Mathematical Thought, while a chapter on physics is continued by Mr. J. W. N. Sullivan, who deals with the problems of gravitation, mass and weight. In two further chapters Professor John Fraser, professor of Celtic at Oxford, writes about the Origin of Language, and Sir Arthur Keith, another familiar name to my readers, about Modern Proofs of Man's Antiquity. The chapter on the Making of the Earth, by Professor J. W. Gregory, is concluded, and to illustrate this there is a fine two-page colour plate. I find that I have mentioned every chapter in this Part except the first, "What is Life?" by Professor J. B. S. Haldane.

A FEW days ago I noticed a reference to one of the lesser-known pioneers of aviation, a man whose name is very rarely mentioned even in short histories of the science. Like many other people, a German named Berblinger, called the flying tailor of Ulm, became enthusiastic about the idea that by providing himself with wings he could fly. He invented a flying suit to which wings were attached, and, having strapped this to his body, offered to test it by starting a flight from the tower of the cathedral. A huge crowd, including the king of Wurttemberg, assembled to see the adventure, but when the tailor took off he descended instead of ascending and with a few feeble, fluttering movements, somewhat suggestive of a wounded bird, fell into the river Danube, where, as an old print shows, he was rescued by some boatmen. This mishap, however, did not deter him, and on the next day he repeated the attempt. But the result was the same. Although, however, Berblinger had done nothing positive, he must be included among those who have aroused interest in the possibility of flight.

TO turn to another subject, readers may perhaps remember the fine colour plate which was included in Part 2 of WAR IN THE AIR. It gave the markings which distinguish the fighting aircraft of all the countries of the world. Civil aircraft, too, have markings which have been agreed upon by international action, and these usually consist of a series of letters. The nationality markings given in the table below are followed by four letters, in the case of a single-letter marking, or three letters after a two-letter marking. The only exceptions to this rule among the countries mentioned are the U.S.A. and Soviet Russia, the national markings of which are followed by numbers. Germany has only recently adopted the use of letters instead of numbers. The table which follows will enable readers to identify the country of origin of most civil aircraft.

C C C P.—Soviet Russia.	OO—Belgium.
CF—Canada.	PH—Holland.
D—Germany.	SE—Sweden.
EI—Irish F.S.	SP—Poland.
F—France.	SU—Egypt.
G—Great Britain.	VH—Australia.
HB—Switzerland.	VP to VR—British colonies, etc.
I—Italy.	VT—India.
N—U.S.A.	ZK—New Zealand.
	ZS—S. Africa.

AS "Flight," in an editorial note a few weeks ago says, five methods of flying across the Atlantic on a commercial basis have so far occurred in the minds of the world's inventors. These are (1) by flying boat, using natural refuelling bases on the way, such as Iceland and Greenland, or the Azores and the Bermudas; (2) by flying boat, using moored vessels, equipped with boarding aprons and catapults, as refuelling bases; (3) by the upper component of a composite aircraft; (4) by airship; and (5) by landplanes using seadromes moored at intervals. Three of these methods have so far been tried out in actual practice. Air France has for some time past been sending flying boats across the South Atlantic, the Graf Zeppelin has been plying regularly for years past over the same route, and the Germans have also been using flying boats in conjunction with refuelling ships on the route to South America. The composite aircraft method (to which we devoted a chapter in Part 23) will, it is hoped, be tried out in the near future.

Order Part 25 of WAR IN THE AIR Today—Out on Thursday, April 23

War in the Air. 24

LAST FLIGHTS IN THE EAST

By Capt. J. B. Sterndale Bennett, M.C.

On the Eastern fronts, and especially in Palestine, the Royal Air Force contributed in no uncertain measure to the final débâcle of the enemy. How their attack demoralized both the Turks in Mesopotamia, as well as in Palestine, and the Bulgars is told in this chapter

WHEN, in June, 1917, General Sir Edmund H. H. Allenby succeeded Sir ArchibaldMurray as commander-in-chief of the forces in Egypt and Palestine, he immediately recognized the necessity of strengthening his air arm. He demanded from the War Office an addition of at least three squadrons, and with these he was gradually, if a little grudgingly, provided. The full complement was not made up until February of the next year.

Yet in no campaign did the Flying Corps distinguish itself more notably or contribute more directly to the final victory than in Allenby's advance on and capture of Beersheba, Gaza and Jerusalem, and those final conquests which, culminating in the battle of Megiddo, broke down the resistance of the Turks in this field of war.

During the months before the main campaign began a great deal of preparatory work was done. An effort towards closer organization was reflected in the formation, in October, of the Palestine Brigade under the command of Brigadier-General W. G. H. Salmond. With rather inferior equipment every branch speeded up its efforts and played an increasingly important part in the work which preceded the battle. A large amount of aerial photography was carried out, and over 500 square miles of territory in the occupation of the Turks were photographed. Co-operation with the artillery by wireless was also improved.

As far as machines were concerned the advantage lay with the enemy. The Germans did not regard the subsidiary campaigns as cadet expeditions debarred from the glories of the main inheritance. They sent their best machines and some of their best pilots to Palestine, to Macedonia and Mesopotamia. The consequence was that up to October, 1917, they had a measure of superiority which made it inadvisable for the British pilots to seek combat. This situation was altered when the first Bristol Fighters arrived from England on October 7. Immediately victims began to fall to the British.

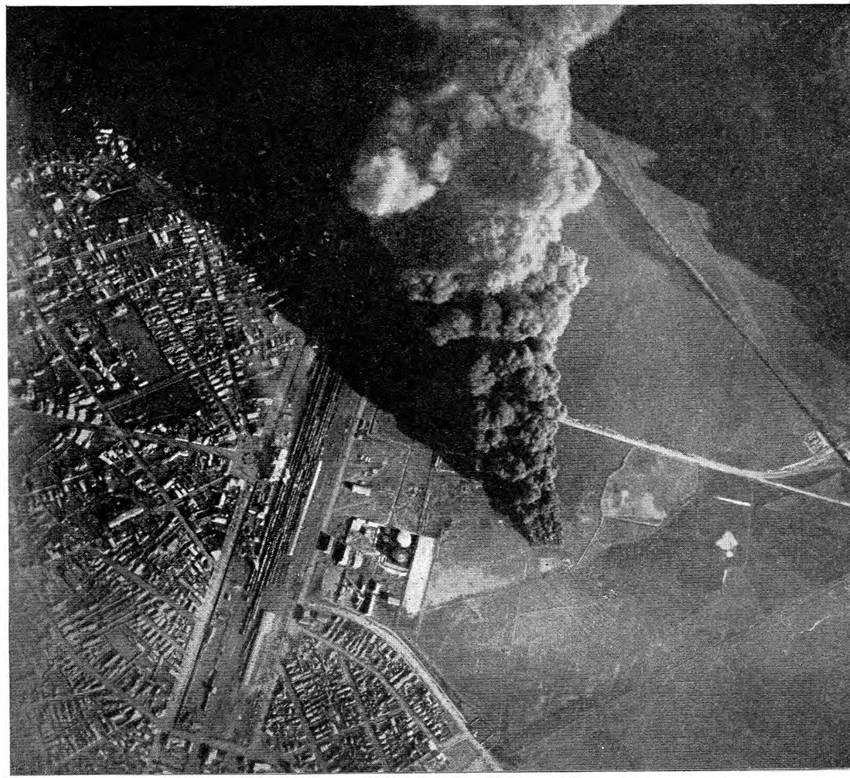
The most responsible task of the Flying Corps was to deny the Turks and the German observers any knowledge of General Allenby's strategical scheme. Everything was done to delude the Turks into believing that the main attack was to fall on Gaza, whereas, in effect, it was to fall on Beersheba. These efforts were entirely successful, but disaster nearly occurred. The incident which might have caused it is thus described by Mr. H. A. Jones in the Official History of "The War in the Air." He explains how, from October 27, a defensive patrol by pairs of aeroplanes covered the line Gaza-Vehelasa continuously from dawn to dusk.

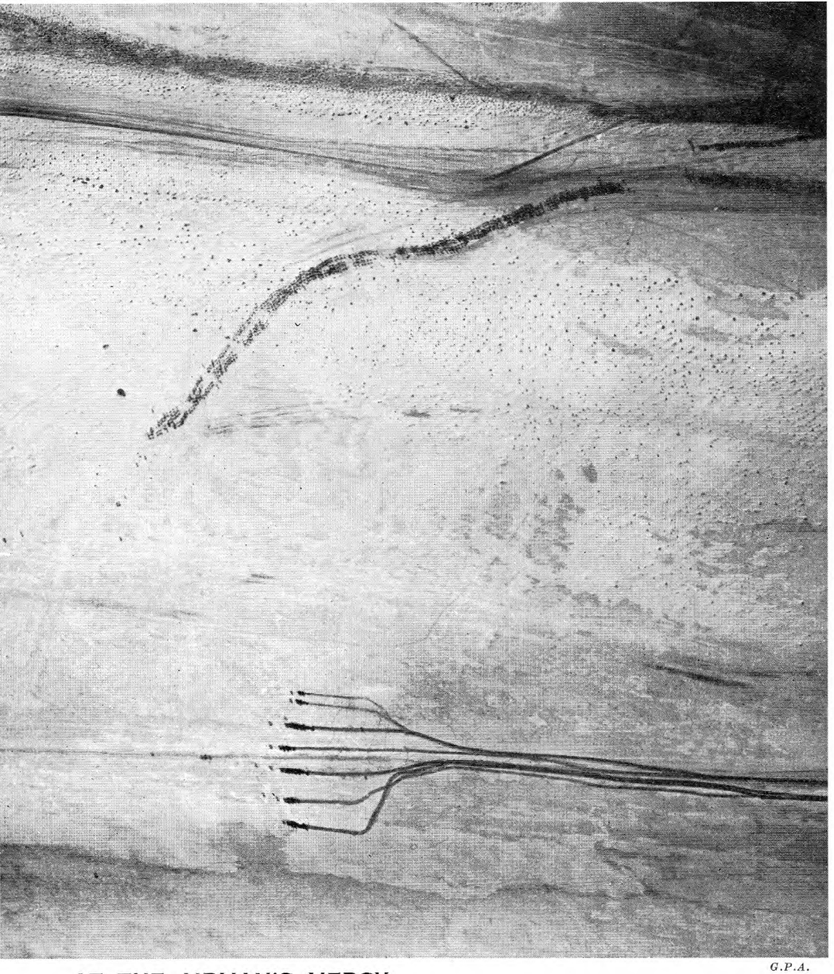
On the 30th, just after the British concentration had been completed, a German two-seater reconnoitring aeroplane, favoured by patches of cloud, eluded the fighter patrol and flew over the British back areas on the Beersheba flank. Photographs of the British dispositions were taken and many important visual observations were made, but when the German airmen, their task completed, were about to recross the lines, they were found by a patrolling Bristol Fighter (pilot, Captain A. H. Peck; observer, Captain J. J. Lloyd-Williams) and were shot down. The two Germans tried to escape from their damaged aeroplane, but they were wounded and were brought in as prisoners. Their photographic plates, marked maps and notes fell into British instead of Turkish hands, and the enemy command was thus robbed of material which must have led to a reconsideration of the British intentions, and also to a change in the dispositions made to meet the British offensive.

It may be remembered that in an earlier chapter (page 439) an exactly similar incident was described on that occasion, the disaster befalling a British officer, Major Reilly. Had he not been

GOING UP IN SMOKE

A well-directed bomb, dropped from a German aeroplane on to a petroleum store at Buzau, in Rumania, set the whole establishment ablaze in a few minutes. Here is the scene as witnessed from the air. A dense column of smoke pours upward for thousands of feet to cast a shadow over the surrounding neighbourhood





G.P.A.

AT THE AIRMAN'S MERCY

In this photograph, which was taken from a German patrolling aeroplane, British troops are seen on the move in the Sinai desert. The aircraft has been observed, and the men, seen as mere specks, are marching in open order, as indicated by the forked tracks left behind. This was a precautionary measure in case the machine should launch a bombing attack. In the upper part of the photograph another column of troops is distinguishable

captured the whole course of the war in Mesopotamia might have been altered and the disaster of Kut avoided. However, he was, to some extent, avenged at Gaza.

The complete sucess of the first operations was followed by the rapid advance of General Allenby on Jerusalem, which he entered on December 11. During the intervening period the Flying Corps continued to show the greatest activity, constantly engaging in reconnaissance, spotting enemy batteries and troops, and giving the Turks a foretaste of the effects of bombing from the air which was to become so terrible to them during and after the battle of Megiddo.

On one occasion, during the advance on Jerusalem, the bombing aeroplanes made themselves more than usually felt. In the British official history there is quoted a German comment on the effects of the bombing at El Tine. It is by the German commander Kress, who wrote: "On the afternoon of November 9 there broke out a panic behind the Eighth Army, among the large number of troops there assembled, transport columns and trains, mechanical transport, aircraft personnel. This did more to break the heart of the Eighth Army and to diminish its fighting strength than all the hard fighting that had gone before." There followed the rumour that British cavalry had broken through, and then: "... many formations began to retreat without orders and broke into flight. A great number of officers and men could not be stopped till they had reached Jerusalem or Damascus." Unfortunately, the British army was not in the position to take immediate advantage of this panic.

But one of the most striking examples of how bombing of a retreating enemy could bring consternation and disaster was afforded in the following year during the last stages of Allenby's campaign. On September 21 the Turks, by this time the helpless victims of Allenby's strategy, were endeavouring to escape through the only gap in the net of cavalry and infantry. But the British airmen executed an outflanking movement that closed the crossing of the Jordan to the fugitives.

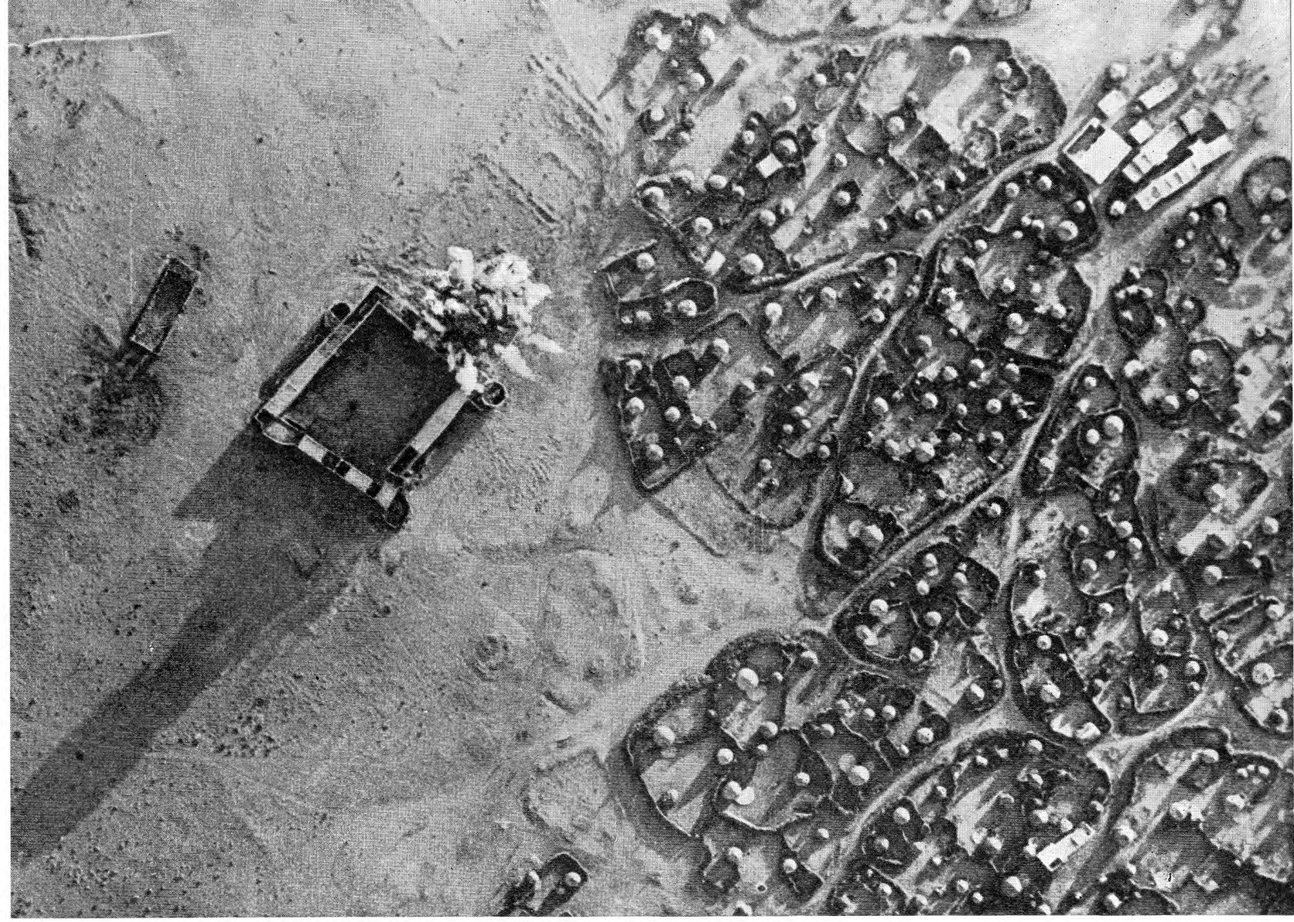
As a result of this, one column of transport fell into the hands of Allenby's cavalry, blocking a crowded road at a point where it ran through a gorge. The bombing aeroplanes then pursued the Turkish transport until it also was forced to surrender to the mounted troops.

Colonel T. E. Lawrence gives the most vivid account of this catastrophe in his book "Revolt in the Desert":

> But the climax of an air attack and the holocaust of the miserable Turks fell in the valley by which Esdraelon drained to the Jordan by Beisan. The modern motor road, the only way of escape for the Turkish divisions, was scalloped between cliff and precipice in a murderous defile. For four hours our aeroplanes replaced one another in series above the doomed columns; nine tons of small bombs or grenades and fifty thousand rounds of S.A.A. were rained upon them. When the smoke had cleared it was seen that the organization of the enemy had melted away. They were a dispersed horde of trembling individuals hiding for their lives in every fold of the vast hills. Nor did their commanders ever rally them again. When our cavalry entered the silent valley next day they could count ninety guns, fifty lorries, nearly a thousand carts abandoned with all their belongings. The R.A.F. lost four killed. The Turks lost a corps.

In clearing up the campaign in Mesopotamia the Royal Air Force played an equally important part—indeed, in this field they probably covered a greater area than on any other front. They had, it is true, an undoubted supremacy over the enemy, but, nevertheless, their work was both hazardous and arduous, for in vast tracts of desert country a forced landing carried with it the imminent danger of death from starvation and exposure. The only hope of the unlucky pilot and observer was that they might eventually be discovered and picked up by the pilot of a friendly machine.

One officer and his passenger, however, had a more spectacular rescue. This was Lieutenant-Colonel J. E. Tennant, who, with Major P. C. S. Hobart, was, on March 25, 1918, shot down behind the Turkish lines. They were made prisoner, mounted on camels and sent north under a Tartar guard.



AIR WAR IN PALESTINE

In the 1914–18 campaign in the East the aeroplane proved its power and usefulness both on reconnaissance work and bombing flights. These two photographs were taken by observers during raids on strategic points and show with remarkable clearness the devastating effect of the bombs dropped from British aircraft. Above, a 65-lb. bomb explodes on an enemy fort situated on the Palestine front. Below, rolling stock and buildings left shattered and burning immediately after an air attack on the railway station at El Apileh, north of Jerusalem

Imperial War Museum





Topical

DESERT CAPTIVE

A chance shot that put the engine out of action compelled the pilot of this German single-seater to land, and both he and his plane were captured by the British. The machine is an Albatros, and the photograph was taken in Palestine in February, 1918. The clean design of the craft, one of the most successful of Germany's war-time types, is noteworthy

In the Official History by Mr. H. A. Jones their rescue is thus described :

On the evening of the 27th, when the two officers were already some distance beyond Ana, Major-General Brooking sent a telegram to Brigadier-General R. A. Cassels, commanding the 11th Cavalry Brigade, saying: "Get Tennant back." When Brigadier-General Cassels reached Ana on the morning of the 28th he learned that the prisoners had left at 4 a.m. on the previous day. He thereupon instructed eight armoured cars, under the command of Captain D. Tod, to go along the A'eppo road for one hundred miles, if necessary and possible, and recover the two officers. The cars dashed forward and many retreating Turks along their way surrendered and were left on the road disarmed. At Nahiyeh Captain Tod was informed by an Armenian that the party he sought was a few hours ahead, and, proceeding with caution, he eventually came within sight of the Tartar escort and their prisoners at a point about thirty-two miles west of Ana.

The captured officers were duly rescued from their terrified guard and the convoy of armoured cars fought its way back to Ana in triumph.

During the last victorious days in Mesopotamia the bombers played much the same part as they had played in Mesopotamia in turning a retreat into a rout. This they did in the operation in April, 1918, against the Sinjabis, a pro-German tribe which menaced the main route to Persia, in the attack on Kirkuk in May, in the operations around Baku in August and in the final advance on Mosul at the end of October. In this last operation the Turks were attacked by bombs and machine-guns from the air so resolutely that the inevitable surrender was hastened. Such enemy machines as were encountered were generally destroyed.

As Allenby had done in Palestine, at the end of 1917, Lieutenant-General Milne, the British commander in Macedonia, pressed strongly for an addition of more and more up-to-date machines for his air force. Up to that time the German pilots with the Bulgarian forces had had an undoubted superiority in the air and had been able to conduct their reconnaissances without much serious interruption, but when, in February, 1918, the War Office reluctantly consigned some efficient fighting machines to Salonika the tune changed very rapidly. Victories began to be scored by the British airmen. During the year they destroyed no fewer than 40 enemy aeroplanes, and shot down out of control or captured 29 others.

It was commendable, too, from another point of view. In the Salonika campaign there was little in the way of specialization. Unlike their comrades on the Western front, the pilots had to be prepared to carry out all and sundry duties. As has been said, they might carry an observer in the morning, on reconnaissance, photographic or artillery duties, and in the afternoon take in his place a load of bombs. They might at any time, when engaged on comparatively peaceful pursuits, be called upon to fight the enemy.

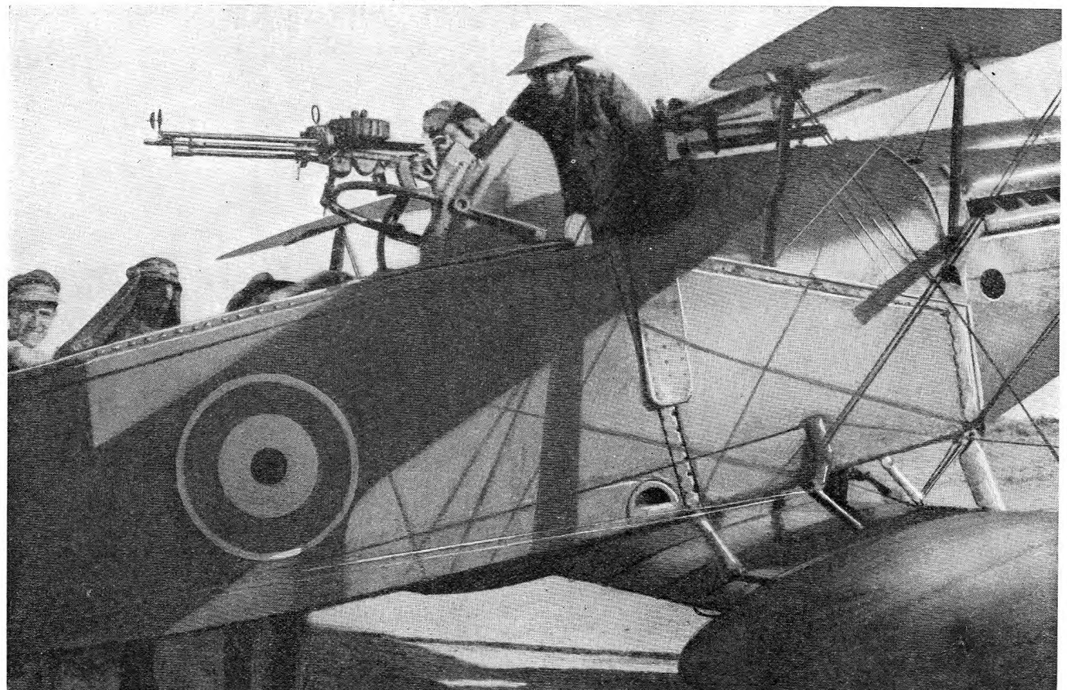
Before the final offensive opened, much valuable reconnaissance work was done. When, on September 15, the attack was launched, which in a fortnight was to break down the resistance of the Bulgarians and lead to the proposal for an armistice, the artillery machines and contact patrols played their part with great energy. The movements of the enemy were under constant observation and his retreat was followed up by the bombers.

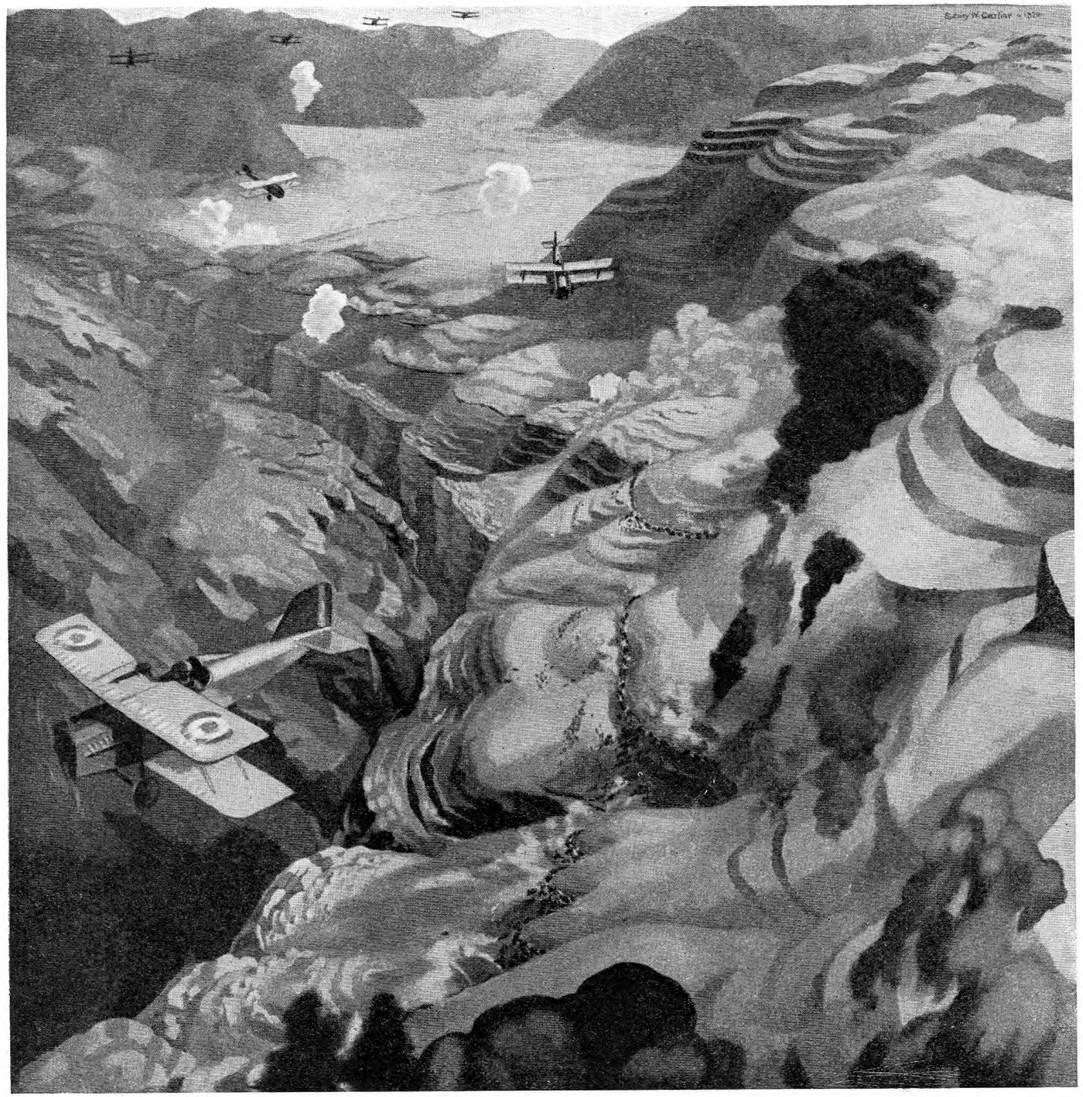
A week before the final débâcle occurred, when the Bulgars evacuated their line from Lam Doirau to the west of the Vardar river, the most deadly attacks were made upon them in retirement. Tons of bombs were dropped on the congested roads, killing hundreds of panic-stricken soldiers, utterly disorganizing their transport and causing them to abandon quantities of guns.

EAST MEETS WESTERN MARVEL

The Bristol Fighter two-seater that proved such a formidable machine on the Western front was also used with great success by a number of squadrons stationed in Palestine. One of these machines is seen here with a member of "Lawrence of Arabia's" bodyguard examining from the observer's cockpit the twin Lewis guns on a Scarff mounting

Imperial War Museum





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VALLEY OF DEATH

In this illustration, reproduced from the painting by Sydney W. Carline, a stirring exploit of the R.A.F. in Palestine is graphically portrayed, as described in T. E. Lawrence's "Revolt in the Desert." The retreating Turks, in September, 1918, entered the Wadi Fara gorge. Trapped in the narrow pass, they were attacked by British pilots, whose bombs, grenades and machine-gun fire wrought complete havoc among the hapless troops



AIRMAN'S VIEW OF LONDON'S AIRPORT

Aero Pictorial, Ltd.

Croydon airport has had a varied existence. During the War a flying-school was opened here; in 1920 the London terminus of the Continental airways was moved to Croydon from Hounslow, and in 1928 the fine new buildings, seen above, were opened. In the foreground are the control tower, booking hall and offices, and beyond them the main hangars. The aerodrome extends over 300 acres

AERODROMES AND AIR LIGHTHOUSES

By Major Oliver Stewart, M.C., A.F.C.

Readers of this chapter will learn much about the remarkable system of control that, by the method of trial and error, has been evolved for the use of aircraft. It is in every way as scientific, as elaborate and as efficient as that in use on the railways

THE definition of an aerodrome must vary with the use to which it is intended to be put. If one makes the definition suit the smallest practicable landing ground one could say that the landing area must be sufficient to allow of an effective runway of at least 300 yards long by 150 yards wide for any wind direction. The term effective runway means a free level surface, not necessarily specially prepared, which is clear of all obstructions, not only in the runway itself but in the line of take-off and landing. As for the aerodrome surface, the rough and ready method of determining this is to drive a motor-car over it.

If the motor-car can be driven at 20 miles an hour without inconvenience to the occupants, the surface may be regarded as suitable for the landing and taking off of aeroplanes. Gradient is limited by the official requirements to one in fifty over all, and no gradient must be steeper than one in forty. If an Air Ministry licence is sought—and it must be sought for all aerodromes which are to be used on a large scale—the aerodrome must be marked in accordance with specified instructions.

A circle of 100 feet diameter, which is always a welcome sight to the cross-country pilot, is called for in the centre of the landing area. The name of the airport may also be displayed, but this is not compulsory. Certain other markings are demanded to show obstructions and to indicate the borders of the landing area, and at least one efficient wind indicator must be provided. The requirements about the size of this are that it shall be visible from a height of 1,000 feet under conditions of good visibility.

When the aerodrome is to be used for night flying, lighting equipment must be provided, and all obstacles round the aerodrome have to be fitted with obstruction lights. Adequate first-aid appliances and crash equipment are also needed and the Air Ministry issues instructions as to these. In the official classification of aerodromes there are no fewer than six types. Class A must have an effective runway of 800 yards or more in length and at least 200 yards in width in all wind directions; this is the largest type of aerodrome and the type to which the chief airports must conform.

Originally the conception of an aerodrome ended when the landing area was of sufficient size, good surface and free from obstructions; but a modern airport is a most complex organization, in which the devices for traffic control alone would require a small book if they were to be described in detail. The general object is always control. The aerodrome control officer desires to control the traffic moving about and over the aerodrome, and for as great a distance as possible around it. The reason for this is that air traffic at the big airports has assumed such dimensions that things cannot be left to the individual pilots.

The first step towards control was the circuit rule. This is left-handed for all civil aerodromes, with certain exceptions. The fact that there are exceptions, Brooklands being one of them, diminishes the value of the circuit rule. Royal Air Force aerodromes have their own circuit rules, which vary according to the orders in force at the time, but most of the larger airports, Croydon and Heston among them, maintain the fixed left-hand circuit rule. This means that an aeroplane which is preparing to land must make left-hand circuits. While the aeroplane is making its left-hand circuits, the aerodrome control officer, who will be in the control tower that usually dominates the aerodrome buildings, will ensure that the ground is kept clear. This he does by withholding permission to any machines on the ground to take off.

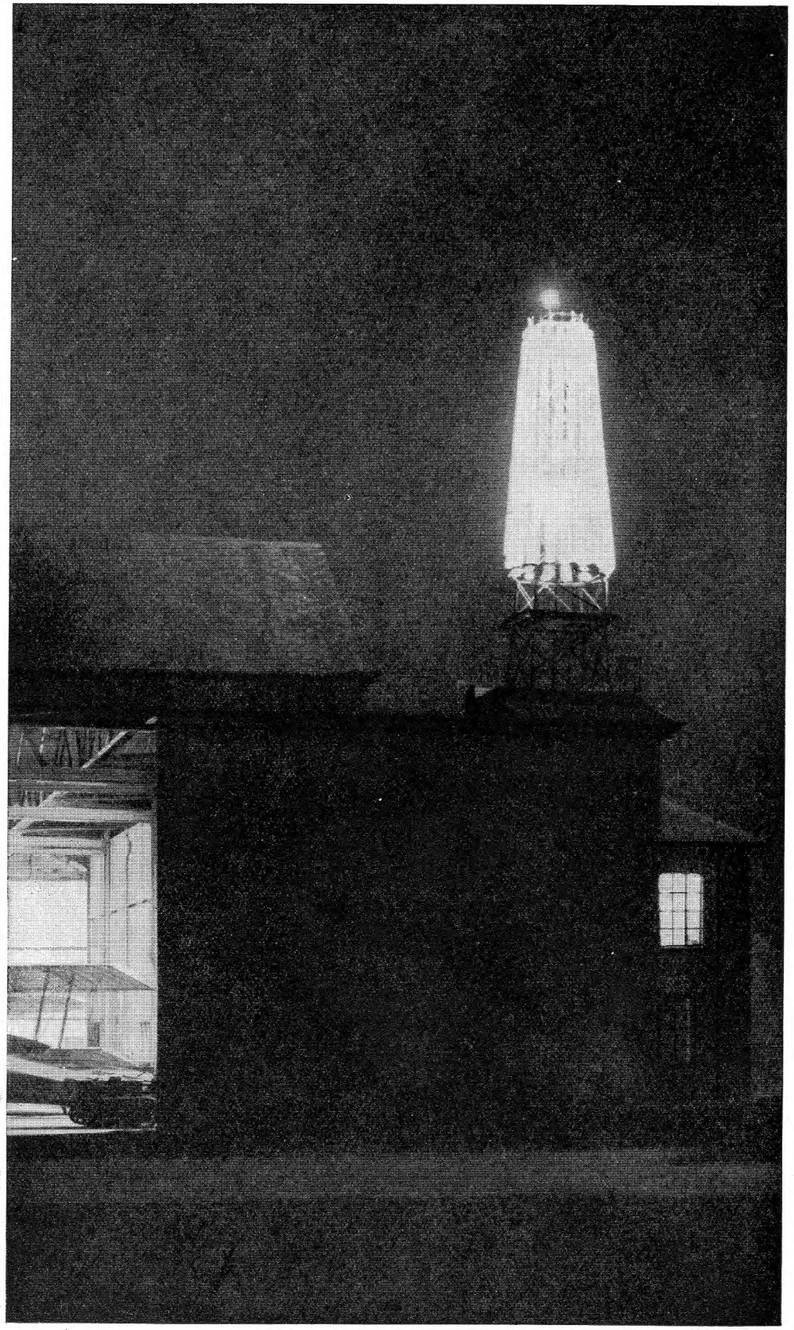
Before it may take off from an airport an aeroplane must receive a signal from the control tower, which may be given

THE GERMAN NIGHT MAIL

For years now, the Deutsche Lufthansa (German Air Lines) have operated a night mail and freight service between London, Cologne and Berlin. The outward-bound machine, a Junkers JU52, is seen here before its departure from Croydon at 10 p.m. The control-tower, brilliantly lit, is on the left, and also one of the new floodlights

Courtesy of G.E.C. Ltd.





Topical

BEACON FOR AIR TRAFFIC

One of the most remarkable features of Croydon airport is the neon beacon, situated in a prominent position at the S. end of the aerodrome (see above). The tubes of this beacon are filled with neon gas, which is well known for its fog-piercing qualities. The beacon's red occulting light has been seen more than 50 miles away, and is the first sign of their destination to incoming pilots at night or in fog.

by an Aldis signalling lamp. The aeroplane will taxi out to the leeward edge of the aerodrome and will then turn into wind. But it must not start to take off until it is released by the aerodrome control officer. Consequently, it will be seen that the responsibility for ensuring that the sky is clear and that no machine is coming in to land just when the other is taking off, has passed from the pilot, who used to bear it, to the aerodrome control officer. At a busy airport this transference of responsibility is most advisable, because it is easier for the aerodrome control officer, perched up in his tower, to obtain a clear idea of what the aeroplanes in the vicinity are doing than for the pilot of any one of them.

Movement of traffic, therefore, at and near the aerodrome, is controlled by the aerodrome control officer. But in recent years his control has been extended farther afield. There is, first, the work of keeping in touch with air liners on their routes. All modern air liners carry wireless equipment and they are in touch with one or the other airport during their flights. An air liner leaving Paris for London will at first keep in touch with Le Bourget, and should the pilot need his position when flying above the clouds he will ask for it from Le Bourget. But about half-way he passes to Croydon, and then he is in touch with the control tower at Croydon airport.

Various methods are used in the different air lines of the world for keeping air pilots informed of their positions and for enabling the aerodrome control officers to follow them, but it will be sufficient here to indicate the method used at Croydon. Let it be assumed that a pilot of an air liner, having left Paris, has climbed through thick cloud layers on the way towards the Channel and that he has come out above the clouds in bright sunshine and sees below him an unbroken sea of clouds. He knows from the weather reports that he received before leaving that the air is clear under the clouds where he wants to descend, at Croydon, and he knows, by dead reckoning, what his approximate position is. But during the flight weather conditions may change. The wind speed and direction may alter.

For this and other reasons the pilot wishes to check at intervals his position. So he uses radio telephony to get in touch with Croydon control tower and asks his position. The next operation brings into action a group of three direction-finding wireless stations in England. The pilot is asked to run his wireless generator, and this provides an easily distinguished signal for the direction-finding stations to work on.



Courtesy of G.E.C. Ltd.

LANDING INTO THE LIGHT

The night-flying equipment of Croydon airport has recently been augmented by the addition of eight 6-kw. G.E.C. landing floodlights of the latest pattern, arranged at intervals round the perimeter of the aerodrome. This photograph shows one of the new floodlights and the remarkable distribution of its light over the huge expanse of the landing area

They obtain the bearing of the machine and immediately tell Croydon control tower what it is. In a few moments, then, Croydon control tower has three bearings taken by the three direction-finding stations. The aerodrome control officer now turns to a special map, at the sides of which bearings are marked as from the direction-finding stations. At the points where the direction-finding stations are situated are holes in the map, and from these long strings can be drawn out.

Receiving the bearings from the direction-finding stations, the aerodrome control officer takes the ends of the strings and pulls them out to the indicated bearings. The result is the formation of a small triangle by the pieces of string. The control officer then knows that the aeroplane, at the instant it sent out its message, was within that triangle. He notes the point on the map and gives the pilot his position by telling him that he is so many kilometres north or south or east or west of a landmark.

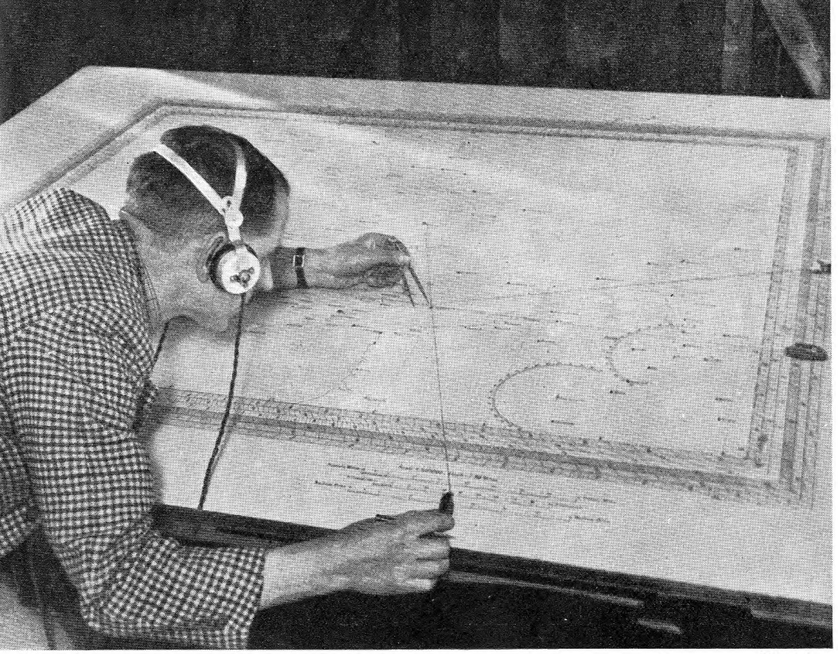
This is the method used in Britain. It has been criticized as clumsy and too slow for modern machines, and eventually it will almost certainly be superseded by other, swifter methods. But it has worked well for a number of years, and it has the advantage, not only of allowing the pilot to obtain his position, but also of keeping the control officer informed of the movements of the air liners. In the United States the passing of the Air Commerce Act in 1926 authorized the Government to provide radio aids to aerial navigation, and a non-profit-earning organization was formed for owning and administering the ground stations. The result is a very fine system of beacons and very efficient radio control. It is quicker than the Croydon system, although whether it is better is an open question.

Although wireless has been used so much for aiding the navigation of air liners, and although it will continue to be so used in the future, it seems probable that it will be confined to beam flying and homing devices rather than to the question and answer methods used at Croydon. Wireless will inevitably assume paramount importance for fog and low-visibility flying.

To reduce the risks of collision when aircraft are flying within clouds and fog the Air Ministry has set aside certain areas for cloud flying, and has established a controlled zone with a definite form of radio communication between aeroplane and ground. Actually there are in the United Kingdom twenty-seven practice and instructional cloud-flying areas and seven civil radio station areas. These are listed in the Air Ministry Notice to Airmen No. 47 of 1935. Instructions are also given in this notice as to the exchange of messages between ground stations and aircraft flying through cloud or in conditions of bad visibility. A separate notice deals with the London-Continent area where special regulations apply.

Probably the use of wireless control for making blind landings has reached its highest pitch of development in the United States, where hundreds of blind landings are made in the airways every year. The Bureau of Standards system of blind landing is done by means of longitudinal and vertical radio guides. Two marker beacons give the aeroplane its position and height as it glides in on the approach, and as it passes the second beacon it is about 25 feet above the ground. The Lorenz system has been adopted in Europe by more than one air line organization and has been installed at Heston.

Finally, I want to consider the pilot's position in relation to airports and airport equipment when flying at night and in fog. The earlier night flights were made with the aid of paraffin flares, which consisted of cotton waste soaked in paraffin, set in petrol cans with their tops cut off, and lighted. These flares were set out on the aerodrome in the shape of the letter L, and



Photopress

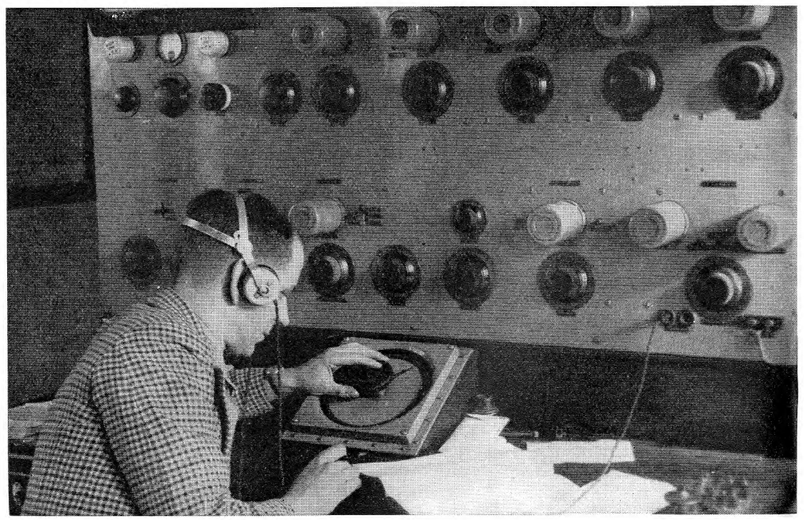
GUIDANCE FROM THE GROUND

Wireless has long been regarded as the "handmaid of aviation," and it is, in fact, impossible to operate reliable air services without the aid of efficient radio. Especially is wireless control from the ground necessary on the London-Continent routes. These scenes at Pulham, Norfolk, show (above) an official plotting the position of an air liner, and (below) using the direction-finder to obtain a bearing

the pilot landed along the upright of the L towards the base. He gauged his height, not by trying to see the ground with the aid of the flares, but by estimating how near they were to coming in line. At the moment when the machine was at ground level the flares would appear almost in line. It was a crude system, but it served; and after it had been superseded by the floodlight it was found useful in fog when the floodlight could not be used.

After the flares came the landing light fitted to the aeroplane. This takes the form of a searchlight, and is fitted to increasing numbers of commercial machines. Alternatively, Holt wing-tip flares may be used. These are ignited by electricity from the cockpit and burn with a bright light for a time sufficient to permit the pilot to make his landing. They have been used by Imperial Airways as emergency night landing apparatus. But the floodlight is at present the normal system of lighting a landing area. A good floodlight will illuminate more than 900,000 square feet of surface in such a way that the light appears to be spread out flat.

Attempts have been made to enable the lighting of the aerodrome surface to be done always from the same source point. However, at present it is usually considered advisable either to have a mobile floodlight or else to have a series of fixed lights at selected points near the edge of the aerodrome and to



use those which fit in best with the wind direction and, therefore, the direction taken by aeroplanes landing and taking off.

Fog flying, so far as the pilot is concerned, is done by the same methods as cloud flying. The instruments are the same and include the turn indicator, fore and aft level and the compass. But the pilot's work is assisted by the radio telephonic messages which have already been mentioned, or, alternatively, by methods of beam flying. It is impossible to do more than touch upon the methods of beam and homing flying that have been developed.

Usually, if a pilot is flying on a wireless objective he receives two separate signals in separate earphones. When the signals fit into one another to form a continuous note he is flying on his correct course. When they separate out to form one or other morse code letter he is deviating from his correct course, and the letter tells him in which direction. The same kind of indication can be given visually by means of an instrument pointer.

It must not be forgotten that all kinds of flying in fog and cloud have been assisted by the development of the automatic pilot, which permits the pilot to set the machine upon a course and then to leave it to the automatic pilot, only occasionally checking the bearing. In spite, however, of the numerous and ingenious devices which have been invented for bringing aeroplanes down at airports in safety where visibility is nil, the blind landing remains a difficult and delicate business not to be undertaken except in extreme necessity. But that eventually the blind landing will form part of the large airport traffic technique cannot be doubted.

Today the pilot still retains a good deal of responsibility, even when he is approaching his airport; but tomorrow it seems probable that the greater part of that responsibility will devolve upon the airport control officer, and that that officer will bring aeroplanes in and release them in all weathers much as if they were under his direct control.

Pioneers of Flying. 9

THE FLEDGELING WORLD OF FLIGHT

By Major C. C. Turner

This chapter contains a description of some of the earliest of the air races, especially the circuit of Europe, the circuit of Britain and the seaplane circuit round Britain that took place before the Great War. Now rather like ancient history, they nevertheless deserve to be remembered and recorded because of the stimulus they gave to the young science of aeronautics

To those whose memories do not go back to the days before the Great War it must be difficult to realize the intense interest and entertainment that were provided by a few score pilots and aeroplane makers with the aid of aeroplanes of speeds of from 50 to 80 miles per hour. Flying had all the fascination of the new and strange, and even, one might say, the mysterious; and, because they were few, the pilots were individually famous.

In those far-off days there were no regulations as to age. Tests for the Aero Club certificate were comparatively simple, although, owing to the characteristics of the aeroplanes, and the fact that dual-control instruction had not been introduced, the risks were greater than those incurred by present-day pupils. The engines were never perfectly obliging, and flight was one long burden of worry about them; all the time spent on the ground was devoted to diagnosing their complaints and attempting to give temporary relief. Hendon, Brooklands, Leysdown and Eastchurch each had its little band of experimenters, but Lark Hill, on Salisbury Plain, was one of the principal training grounds.

Chronologically, Brooklands has precedence over Hendon, and the Isle of Sheppey over both. The late Sir Walter Raleigh said of the community at Brooklands that "it was a society like the early Christians; it practised fellowship and the community of goods." Brooklands saw the foundation of the famous aircraft constructing firms, Martin & Handasyde and A. V. Roe. Here, too, the British & Colonial Aeroplane Co. ran a school, preceded by their school at Lark Hill. This was the first aeroplane building company in Great Britain, and is now famous as the Bristol Aeroplane Co. Brooklands was a stopping place on many of the big air races, and the scene of many remarkable demonstrations, including Pégoud's first exhibition in this country of upside-down flying and looping-the-loop. Sometimes, alas! it became also the scene of tragedy.

Among the first to use Brooklands, in addition to Mr. (now Sir) Alliott Verdon-Roe, were E. V. B. Fisher, the Hon. Alan Boyle, R. F. Macfie, Howard-Flanders, H. A. Petre, Oscar Morison, E. V. Sassoon, C. H. Pixton, E. V. Hammond, F. S. Barnwell, Gordon Bell and many others, most of them, happily, still in the land of the living, and two or three actually still flying.

Leysdown, on the Isle of Sheppey, saw some of the very early British flying activities, for there the late Horace Short and his brothers carried on their work, and members of the Royal Aero Club, including Mr. (now Sir) Francis McClean, Lt.-Col. J. T. C. Moore-Brabazon, the Hon. Maurice Egerton, the late Cecil Grace, Percy Grace and the Hon. C. S. Rolls, were at work in 1909. Subsequently, Eastchurch, which was near, became the principal British flying centre east of London, and there Short Bros. made the first amphibious flying machine. There members of the London Balloon Co. (T. F.) learned to fly on Short aeroplanes, the gift of Mr. McClean; and there, too, four naval officers learned to fly on machines also presented by Mr. McClean.

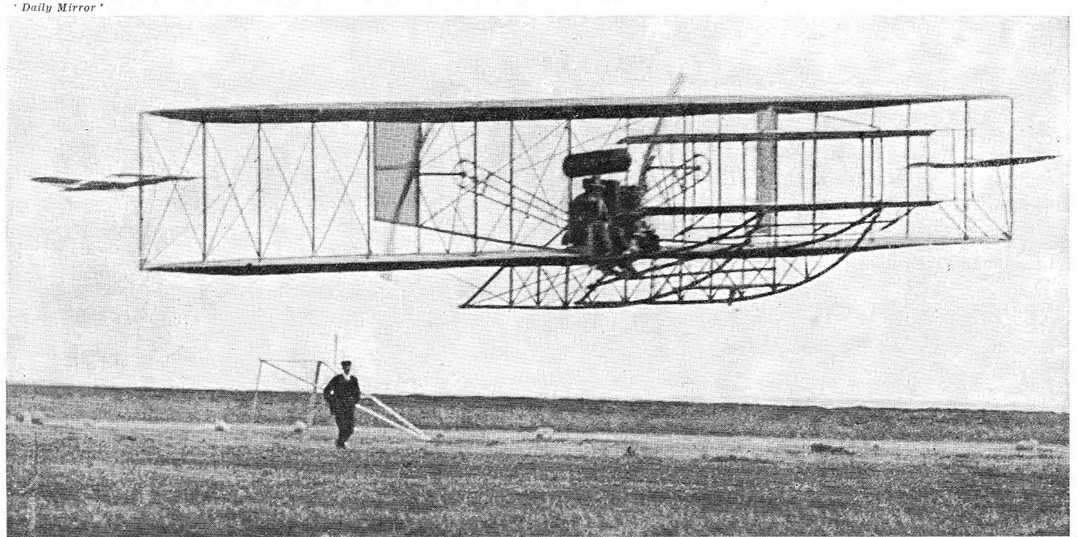
Eastchurch was a stronghold of the small amount of naval flying of those days, and it was also the scene of the Gordon Bennett aeroplane race of 1911, the cup having been won for Great Britain by Grahame-White in America the previous year. On this occasion America regained the cup by the victory of C. T. Weymann on a French Nieuport machine.

Hendon was famous in pre-War days chiefly on account of the weekly flying meetings, which began in February, 1913, and continued almost without a break until the War broke out. With these meetings the names of Claude Grahame-White, the late Richard Gates and Bernard Isaac, as organizers, are

BRITAIN'S FIRST

On October 30, 1909, Lieutenant-Colonel J. T. C. Moore-Brabazon, who holds the first pilot's certificate issued by the Royal Aero Club, won the "Daily Mail" £1,000 prize for a circular one-mile flight on a British-built aeroplane. He used a Wright machine built by Short Brothers, and is seen here flying it at Leysdown, Kent, on the historic occasion

Daily Mirror





CHEERS FOR A HERO

The race between Louis Paulhan and Claude Grahame-White from London to Manchester in April, 1910, is one of the highlights in the history of flying. Here we see the great English pioneer after taking off from Wormwood Scrubs, Willesden, watched by cheering spectators

associated. The meetings owed their success largely to their regularity and excellent programmes, and the fact that those who took part in them became popular figures. There were Frenchmen as well as English, and, flying their heavy Henry Farman, Maurice Farman and Grahame-White biplanes, with now and again something a little faster, round and round the aerodrome, banking steeply at the pylons, and always flying low, they certainly provided spectacles. Among the famous Hendon pilots were the late B. C. Hucks,

Gustav Hamel, Lieut. J. C. Porte, W. L. Brock, L. W. F. Turner, Louis Noel, M. D. Manton, Sydney Pickles, Pierre Verrier, R. H. Carr and W. Birchenough.

The Channel had been first flown in 1909, and in the same year aviation meetings were held at Doncaster and Blackpool. Most of the British pilots had no choice but to fly foreign aeroplanes, but there were notable exceptions, among them being S. F. Cody and A. V. Roe.

Hubert Latham, who had recently failed to precede Blériot in the first Channel flight, flew at the first Blackpool meeting in so strong a breeze that he was regarded as a hero ; today, even pupils go up in the same sort of weather ! The London-Manchester race had been flown, the French victor and the British loser both on French machines. A famous meeting was the one held at Bournemouth in 1910, foreign machines and pilots again being much in evidence.

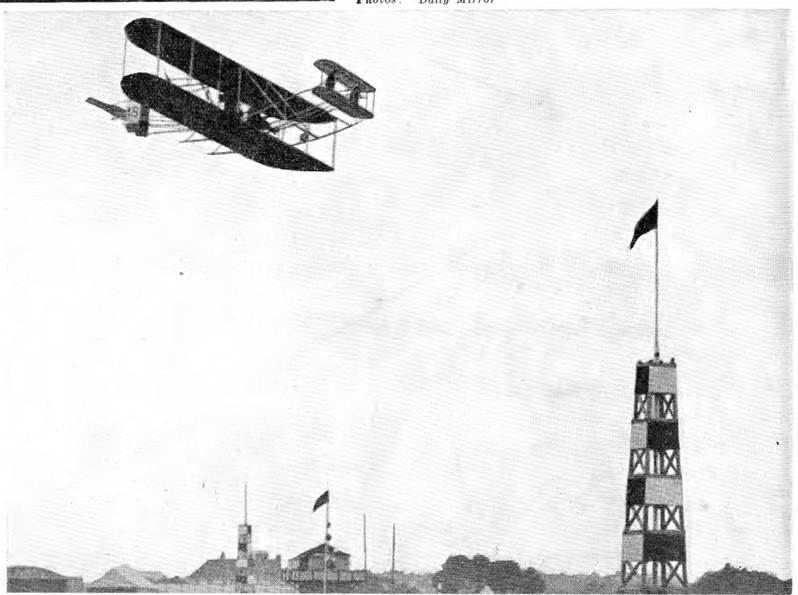
Cross-country flying was sufficiently remarkable for newspaper notice on every occasion. Aerial touring was in its infancy, and early in 1911 Gustav Hamel, Robert Slack, B. C. Hucks, S. V. Sippe, Grahame-White and others were carrying out tours in Great Britain on French machines. Graham Gilmour, at the same period, was using a Bristol biplane, but it was fitted with the almost universal French Gnôme engine.

Among the air contests in which Great Britain was particularly interested

BOURNEMOUTH MEMORY

On July 6–16, 1910, a flying meeting was held at Bournemouth. Among the 17 competitors was the Hon. C. S. Rolls, in a Wright biplane. He is seen below flying over the racecourse shortly before the crash in which he was killed. Rolls was the first air victim in England

Photos : 'Daily Mirror'



before the War were the European circuit and the circuit of Britain, both in 1911. In the big races on the Continent, such as the Paris-Madrid and the Paris-Turin-Paris, there were no British entrants. Three fatal accidents marred the opening of the circuit of Europe, June 18–July 8. This race was one of 1,025 miles, the route being Paris-Liége, Liége-Spa-Liége, Liége-Utrecht, then to Brussels, Roubaix, Calais, Dover, London, Dover, Calais, Paris. There was no very difficult country to fly over and the Channel was patrolled. Competitors were allowed to change their machines at any of the stopping places. The prize money amounted to £20,000. Of the 60 entrants, 38 started, and only



Topical

AIR RACER—1911

An air race, planned on an ambitious scale, was held in June, 1911. Known as the European Circuit, it attracted 60 entrants, amongst these being two Englishmen — Oscar Morison and James Valentine. The latter is shown above, seated in the cockpit of his Deperdussin monoplane, just before the start

nine completed the course by the stipulated date. Two Englishmen, James Valentine on a Deperdussin and Oscar Morison on a Morane, entered. Morison hit some trees soon after the start and had to give up. There was one English machine in the race, a Bristol biplane, flown by Tabuteau.

At this date, since Blériot's pioneer feat in 1909, there had been only six cross-Channel flights, but in the European circuit eleven crossed it during one day. Dover waited up all night to see them, and within a period of 45 minutes they all arrived, led by Védrines, who was followed closely by Vidart,

FRANCO-BRITISH EFFORT

The airman seen right is the Frenchman, Maurice Tabuteau, well known in the early days for his long-distance record flights and a daring crossing of the Pyrenees. He competed in the European Circuit in 1911 when he piloted a British-made Bristol biplane



Topical

Gilbert and André Beaumont (Lieut. de vaisseau Conneau). James Valentine was seventh ; Train, whose machine was one of his own construction, came next, and had a great reception, for he was not assisted by a service of mechanics. A subscription was raised for him at Calais. After Train came Tabuteau, who landed at Dover in a spectacular spiral, which, at a later date on Salisbury Plain, he repeated with the present writer as passenger. He was a great flight artist and was one of my instructors. At one time he held the world altitude record. Beaumont, on a Blériot, won the event, and took no less than £6,466 ; Garros won £2,240 ; Védrines, although placed sixth, won £2,080, chiefly made up of minor prizes for stage to stage performances. While that race was being flown a German national circuit was in progress.

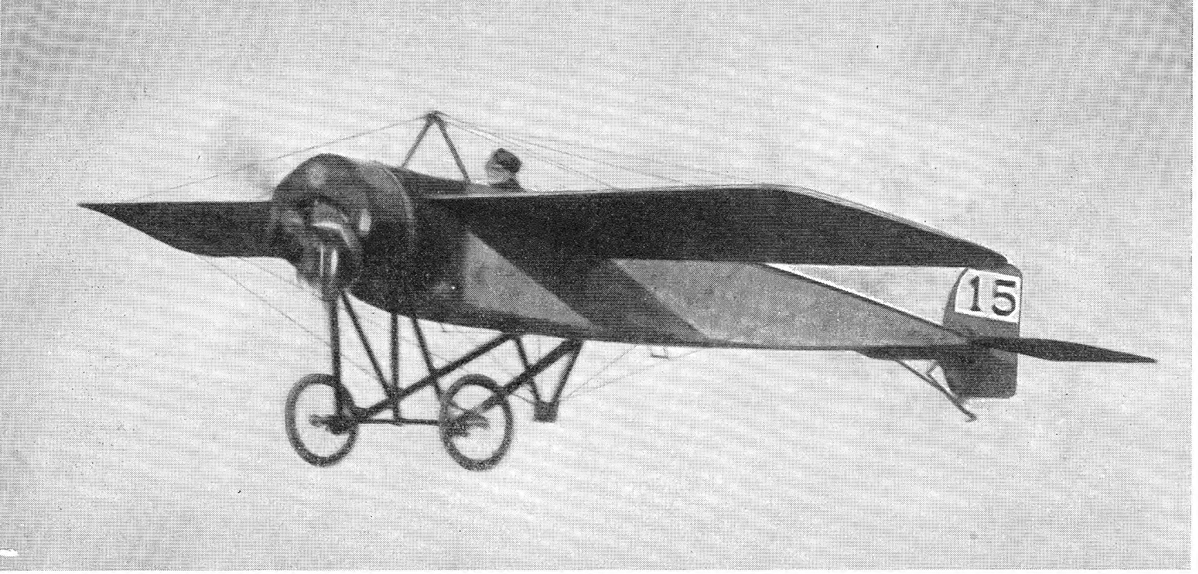
A fortnight later the circuit of Britain took place. This was a contest in which the rules were designed to test airworthiness of machines. Parts of the aeroplanes and engines were stamped and were not to be touched or replaced during the contest. The propellers could be changed and undercarriages could be repaired. The route was Brooklands-

AMERICA WINS A PRE-WAR CLASSIC

Charles T. Weymann, who represented the United States in the third Gordon Bennett air race, held at Eastchurch, Kent, in 1911, was a well-known pre-War pilot. He is seen below rounding a pylon on his 100 h.p. Nieuport monoplane during the contest, which he won. He finished the 94-mile course at an average speed of 78·77 m.p.h.

Sport & General





Central Press

HAMEL HUSTLES HOME

The Aerial Derby, which was inaugurated in 1912 and continued as an annual event for some years after the War, was Britain's premier aviation contest. In the first year the race was won by Mr. T. O. M. Sopwith, and on the second occasion (in 1913) by Gustav Hamel, who is shown here in his 80 h.p. Gnôme-engined Morane, which he piloted round the 94½-mile circuit at an average speed of 76 m.p.h.

Hendon, Hendon-Edinburgh, via Harrogate and Newcastle; then to Stirling, Glasgow, Carlisle, Manchester, Bristol, Exeter, Salisbury Plain, Brighton, Brooklands, a total of 1,010 miles, and over much more difficult country than the European circuit. There were 30 entrants and 20 starters.

On the afternoon of the race the thermometer registered 92° in the shade and the heat eddies made Brooklands, always a tricky aerodrome, very dangerous. A hot, gusty wind was blowing from the south-west, and the start was postponed for an hour. The competitors were then sent off at four-minute intervals, their order having been arranged by drawing lots.

Of the twenty starters, only two completed the course—Beaumont, on a Blériot, in 22 hours 28 minutes 18 seconds, and Védrines, on a Morane-Borel, in 23 hours 31 minutes 56 seconds. Two, Lieut. J. C. Porte and F. Conway Jenkins, had crashed at the start. Conway Jenkins was flying a monoplane, the Blackburn, almost for the first time. Porte, after an awkward ascent, got into difficulties at a spot where three previous starters had struck a bad eddy. His machine side-slipped and then plunged to earth. Two others, C. C. Paterson and Audemars (Switzerland), retired at Hendon.

Lieut. Bier (Austria), on his Etrich monoplane, a bird-wing, inherently-stable type, fitted with a 120 h.p. Austro-Daimler engine, after two starts retired near Hatfield. He was the only competitor who carried a passenger. Prince Henry of Prussia, who was among the thousands of spectators at Brooklands, was, by the way, greatly interested in Lieut. Bier and his machine. B. C. Hucks and G. Blanchet both damaged their machines near Luton and had to retire. C. P. Pizey, on a Bristol biplane fitted with a Gnôme engine, reached Melton Mowbray.

Six competitors got as far as Yorkshire—Gustav Hamel, C. T. Weymann (America), Howard Pixton, de Montalent, H. J. D. Astley and Lieut. H. R. P. Reynolds. Hamel's machine was wrecked near Wakefield; Weymann, on his fast Nieuport, retired at Leeds; Pixton, on a Bristol biplane with a Renault engine, wrecked his machine at Spofforth; de Montalent, on a Breguet biplane with a Canton-Unné engine, lost his way and descended at Wetherby; Astley, on a Birdling monoplane, and Lieut. Reynolds, on a Howard-Wright biplane, both reached Harrogate before retiring. Cody reached Newcastle on the second day, but soon after starting off again damaged his machine. Valentine got as far as Carlisle.

Another important race—although there was only one starter, and his machine was wrecked before it completed the course—was the seaplane race round Britain for which Viscount Northcliffe offered a prize of £5,000 to the British airman who could complete the course, 1,540 miles, in 72 hours' flying time, on a British machine with a British engine, with a passenger.

From the beginning nothing went right. The Admiralty raised objections to the proposed route, and the "controls" were finally altered to Ramsgate (instead of Southampton and Dover), Yarmouth, Scarborough, Aberdeen, Cromarty (instead of Inverness, Oban, Dublin), and Falmouth (instead of Southampton). Neither naval nor military authorities allowed their pilots to take part. August 16–30 was the period for the race. There were only four entrants—Cody, who was killed in an accident at Farnborough almost on the eve of the contest; Mr. McClean, who, long after the departure of the only competitor, decided to withdraw owing to engine troubles; J. Radley and Gordon England, whose entry was withdrawn, and T. O. M. Sopwith.

Sopwith's pilot, the late H. G. (Harry) Hawker, accompanied by his mechanic, Kauper, made a good start on August 16 and reached Yarmouth in just under four hours. After this they encountered many delays and difficulties, but they had almost reached the Dublin control before disaster overtook them.

At the time they were travelling very low, about 60 feet above a shallow lagoon, when Hawker made a mistake with his steering-gear caused by his foot slipping from a greasy pedal. The machine immediately plunged into the sea and was too badly damaged to be repaired in time to continue the race. Hawker escaped serious injury, but when Kauper was rescued by the coastguards he was found to have a broken arm and severe head cuts.

Flights across the English Channel had not become common before 1912. In August of that year W. B. Rhodes-Moorhouse, who afterwards won the V.C., made the first Channel crossing with two passengers, his wife and J. H. Ledeboer. The machine, a Breguet, was wrecked in landing near Ashford.

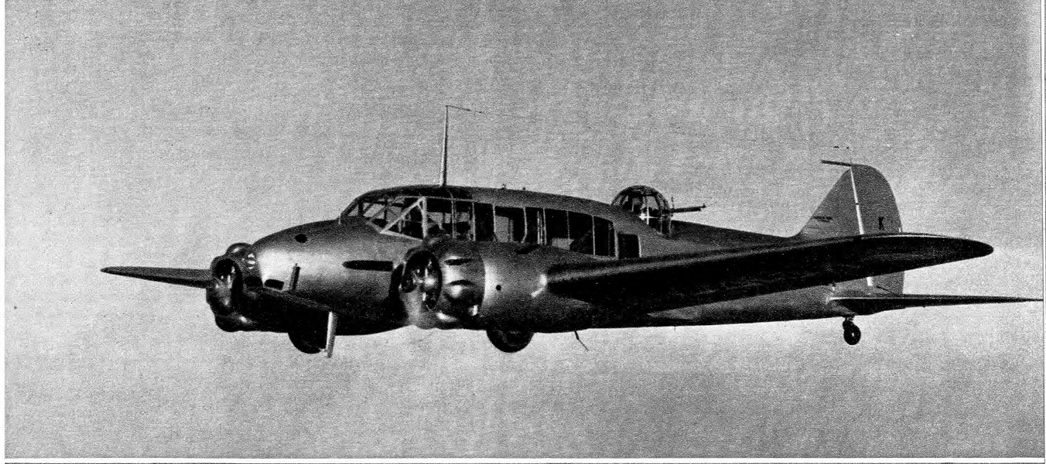


Wide World Photos

TRIPLE PIONEER OF THE POST-WAR ERA

Rear-Admiral Richard E. Byrd, explorer, aviator and retired naval officer, became world-famous by his flight over the North Pole in 1926, piloted by Floyd Bennett. In the following year he succeeded in another and equally difficult endeavour—the Atlantic crossing from America to France. In 1929 he conquered the South Pole, being the first man to fly over both Poles. Byrd has since further explored the Antarctic, particularly near the Ross Sea







BRITISH WARPLANES OF THE THIRD DECADE

Photos: Courtesy of 'Flight'

The two aircraft illustrated here—the Hawker F36/34 above, and the Avro "Anson" in page 757—are outstanding designs conceived by Britain's military air experts during 1935–36. It will be noted that both are remarkably "clean" low-wing monoplanes; but there the similarity ends. The Hawker is an experimental single-seat fighter with a semi-secret Rolls-Royce engine; a speed of 300 m.p.h. is claimed. The "Anson" is the first of a new class—general reconnaissance—and has been ordered in quantity for the R.A.F. The careful cowling of the twin Siddeley "Cheetah" engines is typical of the whole design



AIR-LINE WHICH NEVER SLEEPS

Courtesy of G.E.C. Ltd.

Every year sees development in night-flying over the world's air-routes, and Imperial Airways are fully alive to the advantages of a 24-hour schedule for both Continental and Empire time-tables. Above we see their 38-passenger "Heracles" at rest on the tarmac of Croydon airport, in the bright light of a floodlight. In the background is a German Junkers freighter

World's Wonder Planes. 17

BRITAIN'S NEW WAR PLANES

By Major C. C. Turner

It is something of a relief to learn from an undoubted authority that Great Britain is not so lacking in inventive capacity and technical skill as we are sometimes led to believe. Given anything like equal conditions, her engineers can produce aircraft at least equal to anything built abroad

In all aircraft-producing countries Governments impose secrecy upon those engaged in the design and manufacture of new aeroplanes. Different countries adopt different conditions and terms of secrecy. The British Air Ministry, in framing its regulations, bears in mind not only the need to hide, so far as is possible, new inventions and design policy from foreign countries; it also has regard for the interests of the manufacturer, who has not only production for the Government to consider, but also the need to provide aircraft for export. The export of aircraft is, indeed, to the Air Ministry's advantage in so far as it stimulates greater quantity production. Accordingly, the authorities permit the lifting of the veil of secrecy as soon as possible.

Machines on the secret list of the Air Ministry must in no circumstances be described. But as soon as a new type has flown, and even before it has passed through any manufacturers' or Air Ministry test, it is placed on the part publication list, and then the fact of its existence may be published, but no figures relating to performance or details of equipment. Photographs may, however, be published provided they do not reveal any technical secret. Later on it is placed on the open list. In many cases, meanwhile, the manufacturer is free to take orders from foreign governments.

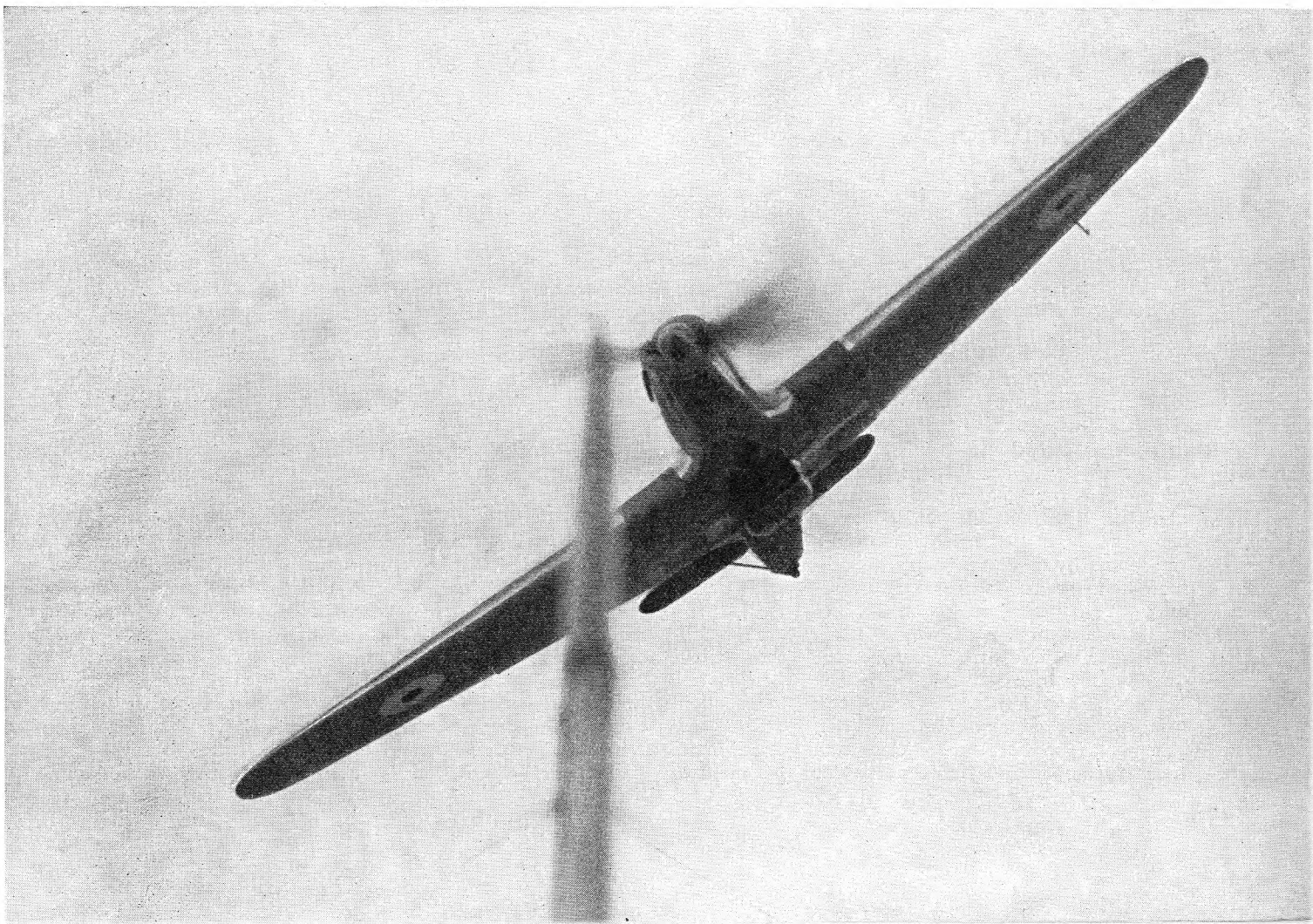
In practice the Air Ministry system has worked well enough, although inevitably secrets leak out and foreign newspapers, being under no obligation of secrecy, have from time to time published facts about new British aircraft denied to the British press! In most countries, needless to say, there are foreign agents whose mission it is to discover secrets of this kind and inform their employers; but although this goes on, and although, as already said, foreign newspapers sometimes publish details which do not appear in British newspapers, the need for the secret list restriction remains.

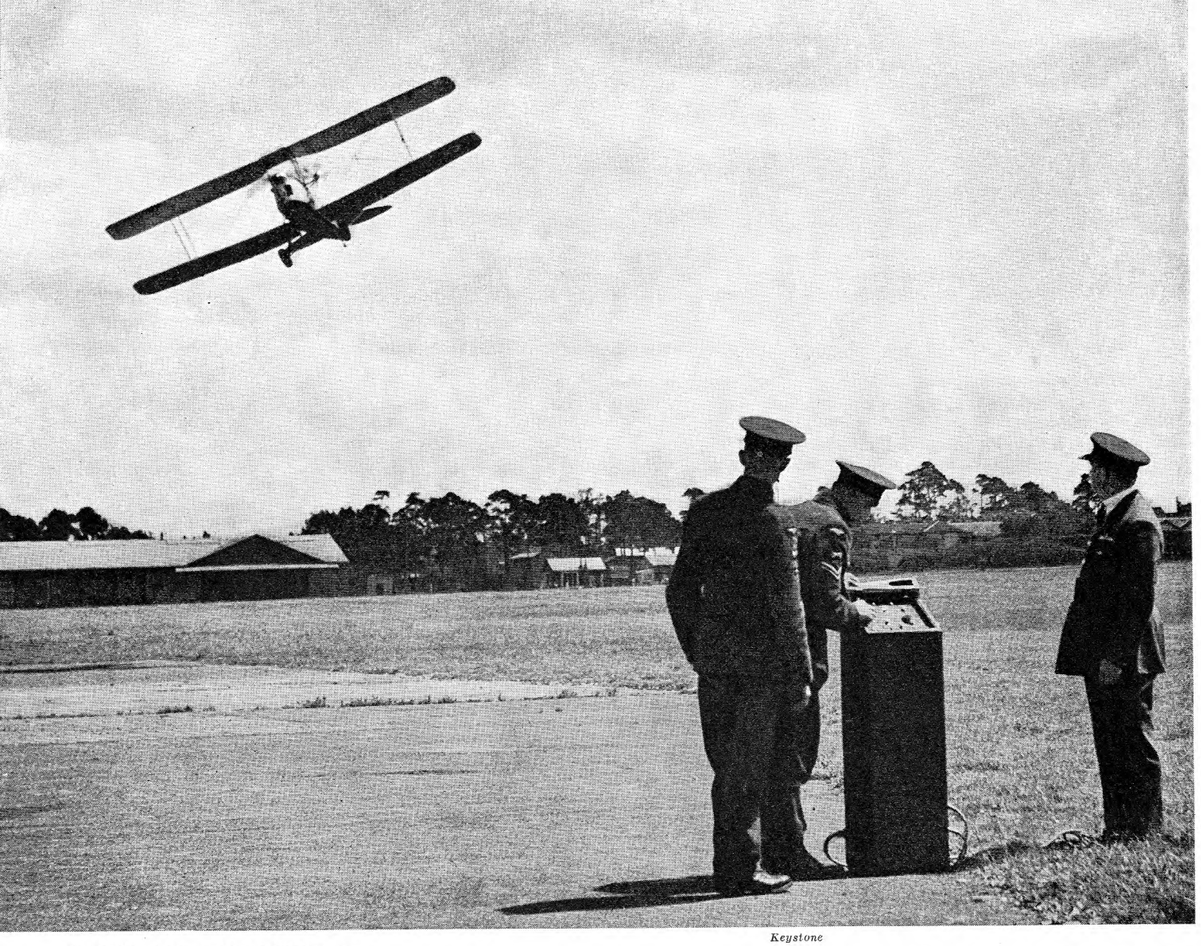
Another consideration is that of a manufacturer's rights to patents; and

THIRSTING FOR A FIGHT

In this "action" photograph, some of the remarkable features of the Hawker monoplane fighter (also illustrated in pages 756 and 761) may be seen. The undercarriage is completely retracted, and the radiator is the only excrescence visible on the under-surface of the machine. The engine is a new Rolls-Royce engine named the "Merlin," delivering about 1,000 h.p. The monoplane is in the capable hands of Flight-Lieut. P. W. S. Bulman, chief test-pilot of the Hawker Co.

L.N.A.





Keystone

UNHUMAN EVOLUTIONS

The aeroplane controlled by wireless from the ground is a startling and far-reaching invention. The D.H. "Tiger Moth" has been adapted and renamed the "Queen Bee" for exhaustive experiments, which have been carried out at Farnborough (where the above photo was taken), and also by the Royal Navy. The wireless-controlled plane can perform all the essential manoeuvres of the normal machine, and may be used either as a target or as a not very accurate pilotless bomber

this in some cases is a ruling consideration, the Air Ministry co-operating with the manufacturer in maintaining secrecy until such time as the rights may be legally secured in foreign countries.

With regard to new civil aircraft, no secrecy is imposed except in those cases in which the Air Ministry is directly concerned—as in certain experimental types—or in which national interests are at stake. In the later Schneider Trophy contests the cost of the British machines was borne by the Air Ministry, to promote high-speed flying research regarding both aeroplanes and engines. Since an international contest was at issue, and one in which Governments became directly interested, it was obviously inadvisable to inform our rivals exactly what we were doing. But, in brief, there is a good deal more close and friendly co-operation between the Air Ministry and manufacturers in these matters than is commonly believed to be the case.

Towards the end of 1935 the international situation worsened to such an extent that the possibility of a European war has, unfortunately, again become a serious question, and it became necessary to tighten up the regulations with regard to preserving secrecy as to new aircraft and equipment, and with regard to defence policy generally.

Aircraft design is in a very fluid state, as it always has been, and there is a basis of truth in the common saying that a new aeroplane is obsolescent as soon as it leaves the construction shed. Certain it is that the aircraft designer is usually at work on a still newer design than the one in hand; and very often, moreover, there is at the back of his mind the embryo idea of an even more advanced type. With him it is never a case of being off with the old love before taking on the new.

The decision, taken in 1935, to expand the Air Force compelled the Air Ministry to shorten the development period of new types, so that, instead of a three or four years' process, including a very elaborate series of trials, greater freedom was given to designers and manufacturers, whilst in some cases new types were ordered "from the drawing-board," naturally on certain stipulations. One result was a vast amount of behind-the-scenes work, the result of which will be revealed in due time.

Incidentally, the emergency brought out the gratifying fact that British designers are at least as good as any in the world, and that they were equal to producing the best types in all classes—in fact, types embodying all the latest research in every detail.

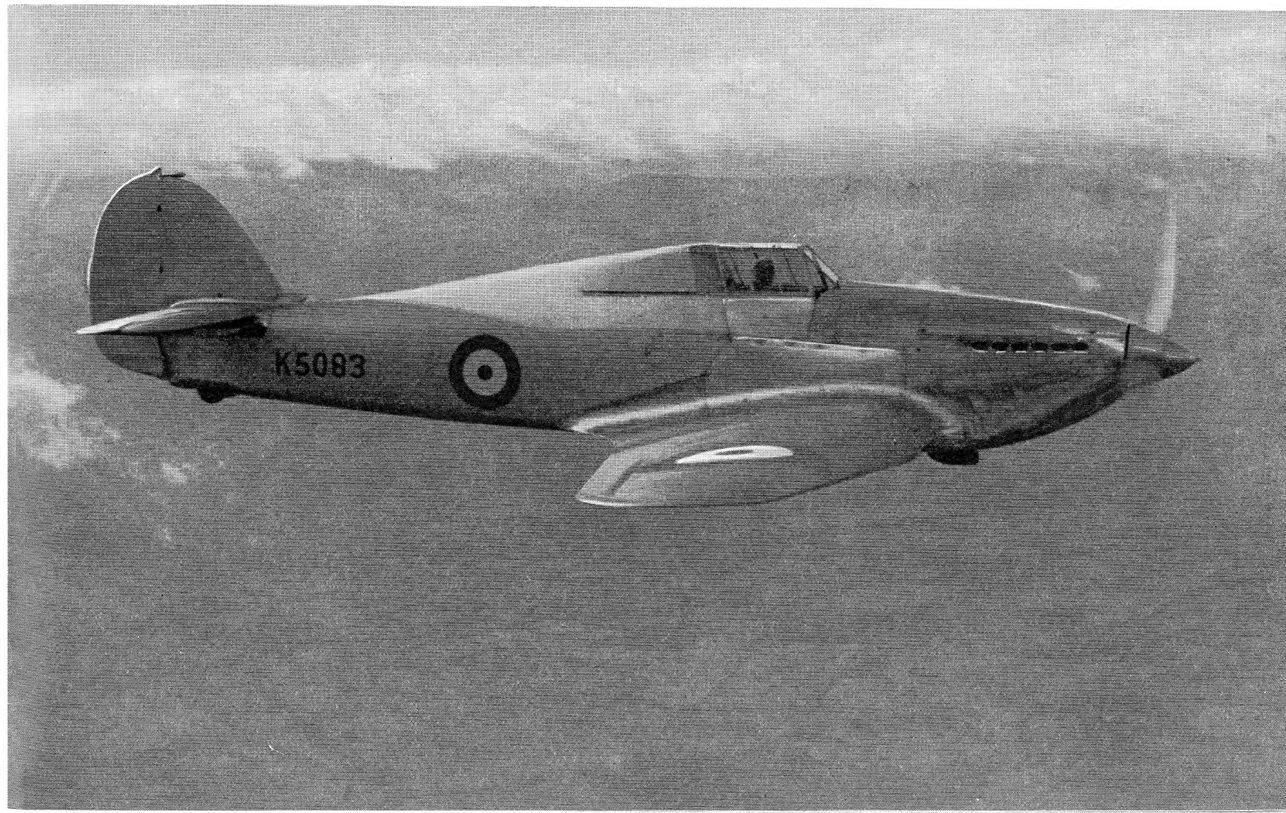
It was a remarkable circumstance that two of these types were originally designed as civil aircraft, pointing to the fact that British design—and that not under the stimulus of military



Courtesy of 'Flight'

PEAK OF PERFORMANCE FOR BOMBING AND FIGHTING

The maximum speed (268 m.p.h.) claimed for the Bristol 142 (above) makes it one of the fastest multi-engined aircraft ever built. The prototype was ordered by Lord Rothermere as a transport machine. He christened it "Britain First," and presented it to the Air Ministry. The latter were so impressed by its capabilities that a large order was placed for a bomber version. Below, another view of the amazing Hawker monoplane fighter, showing the enclosed pilot's cockpit and carefully cowled engine



preparation—was not so behind the times as the belittlers of British effort would have us believe. The types referred to are the Avro Anson and the Bristol twin-engined bomber. The Anson was intended as a high-speed mail, or feeder line, plane, and it was so excellent that the Air Ministry saw in it a great possibility for coastal reconnaissance.

Previously, there was no similar machine in this class, and the few flying boats stationed in British waters were far too slow, considering our particular defence problem, namely, that of ranging the narrow seas round Great Britain in the shortest possible time, co-operating with the units of the home defence Air Force. The work includes warning of air raids and of naval movements, and submarine detection. Now, the advent of the Avro Anson ushered in a new element in national air defence, and the prompt decision to order it in large numbers was evidence of the existence of an alert air staff.

The Avro Anson machine is a low-wing monoplane, fitted with two Siddeley Cheetah supercharged engines of 310 h.p. Its top speed is 188 m.p.h., and its range with full load 760 miles. It has a closed-in cabin and a retractable undercarriage.

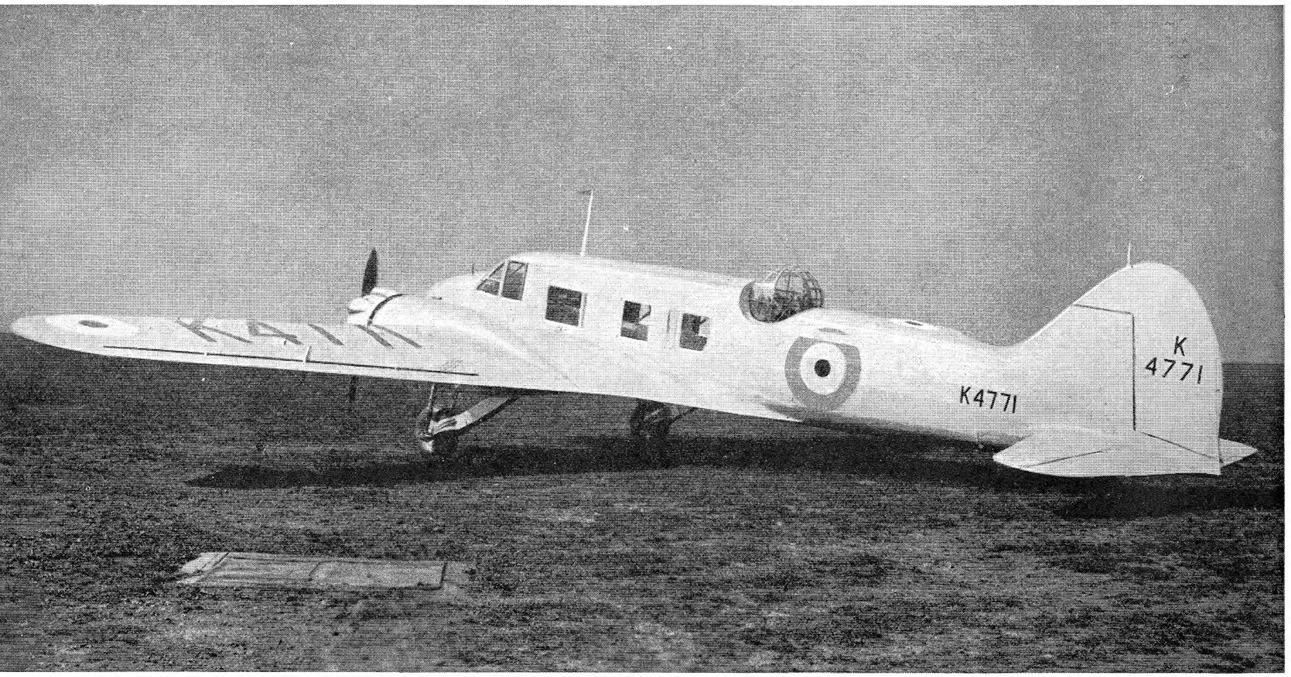
In the head of the body of the machine there is a prone bomber position, and the bombs are carried in the wings or the fuselage, out of sight, clear of the slipstream. It is armed with a machine-gun on top at the back of the cabin, so that the gunner can deal with attackers from above or behind. He has a rotatable gun-turret, which protects him from the force of the wind and enables him to train the gun with ease, despite the rush of air. This position for the gun is interesting because it provides for a low-flying escape from superior forces, low flying being the safest strategem, and one giving the best chance of eluding observation. Primarily, the duty of this class of machine is to get safely away with news of enemy movements.

The principal structure of the Anson is metal, but, like nearly all Avro productions, its wings are covered with plywood. The machine carries a collapsible dinghy, and, indeed, embodies a large number of details of great technical interest.

The Bristol machine was foreshadowed by one of the exhibits at the Paris Aero Show of 1934, a complete fuselage illustrating a new method of construction. This was eventually incorporated in a complete high-speed civil machine; and, again, the Air Ministry's attention having been called to it, a prompt order was placed for the type modified as a medium high-speed bomber. In its civil form the Bristol attained a speed of something like 270 m.p.h., but with the more powerful engines used in the military type its maximum speed, attained at Martlesham, was greater.

A new series of high-speed fighters was projected before the Air Force expansion scheme was announced, and, as a consequence of that emergency, their trials and production were accelerated. It had been freely hinted that the new class of fighters would have closed-in cabins and retractable undercarriages, and would have a maximum speed approaching 300 m.p.h.; and rumour soon hinted that this speed had been attained.

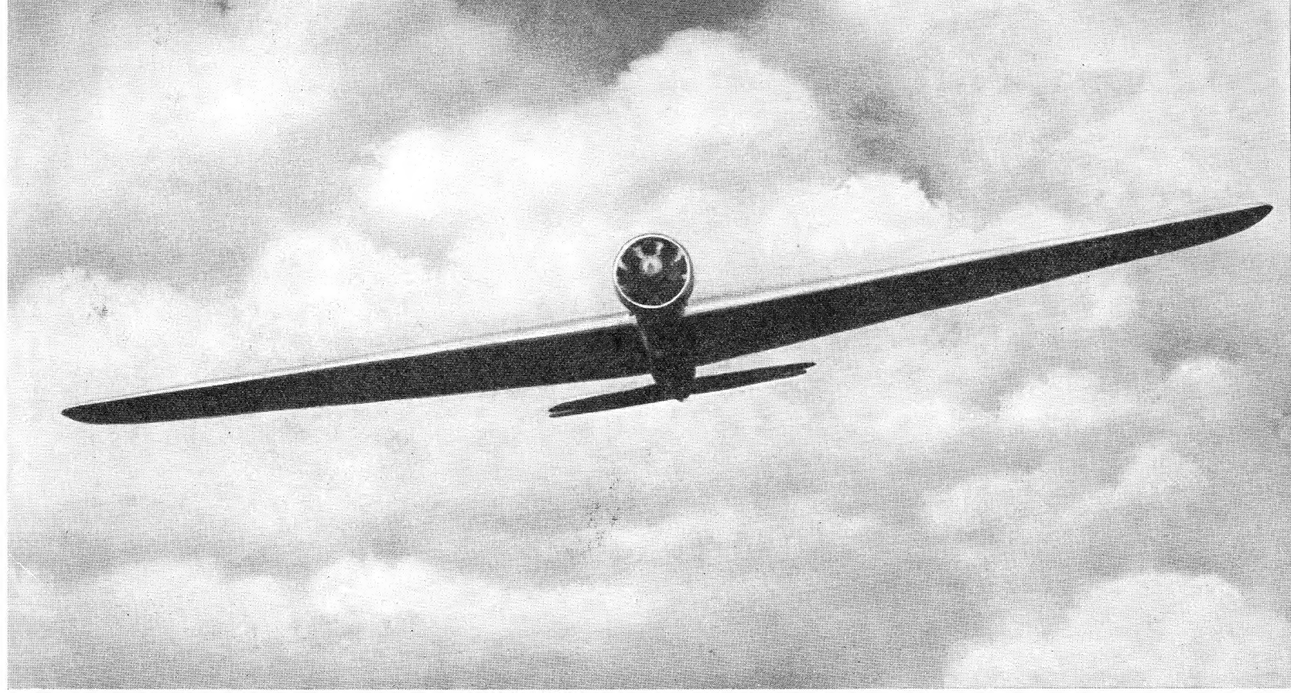
The first of the class to undergo trials was a Hawker monoplane. It had been intended to provide it with a variable-pitch propeller, but so good was its take-off with an ordinary



Fox

HIGH-SPEED LIAISON ONLY ONE OF ITS DUTIES

Until recently, the important task of patrolling the coasts of Britain was entrusted to flying boats. With the adoption of the Avro "Anson," however (see above), a new class came into being—the fast general or coastal reconnaissance machine. The "Anson" (also illustrated in page 757) carries a crew of three and is ultra-modern in design, being the first type with retractable undercarriage to be standardized in the R.A.F. It has a rotatable rear gun-turret, and the bomb load is carried internally



Associated Press

LONG RANGE WITH HEAVY LOAD

The Vickers "Wellesley" general-purpose machine incorporates the Wallis "geodetic" method of construction, utilizing the principle of the spider's web for both wings and fuselage (see page 716). This construction, added to the high-lift, long-span wings—well shown above—and aided by the single 650 h.p. Bristol "Pegasus" radial engine, gives the "Wellesley" a tremendous range, even with military load

propeller—one, moreover, which was suitable for a very high speed—that there was no immediate need to use a variable-pitch propeller, which, needless to say, costs more and weighs more than the fixed-blade kind. As in so many other details of the aeroplane, this is a matter for careful weighing of pros and cons.

The variable-pitch propeller's claim is based chiefly on its value at the take-off. Without it, if the fixed propeller is designed for maximum speed the take-off is longer and needs more room; and, further, this drawback reacts on the amount of load which can be carried.

Whether or not at some later date the Hawker fighter will have a variable-pitch propeller cannot yet be stated. Certainly, some other new fighters, which may be regarded as its rivals, are to have variable-pitch propellers. But it was no small technical achievement to embody in one machine a take-off comparable to that of standard Air Force fighters, and at the same time to attain a 30 per cent increase on maximum speed. All the new fighters are monoplanes, new methods of construction enabling designers to secure great strength even without exterior bracing, whilst the monoplane is a more convenient design for the retractable undercarriage.

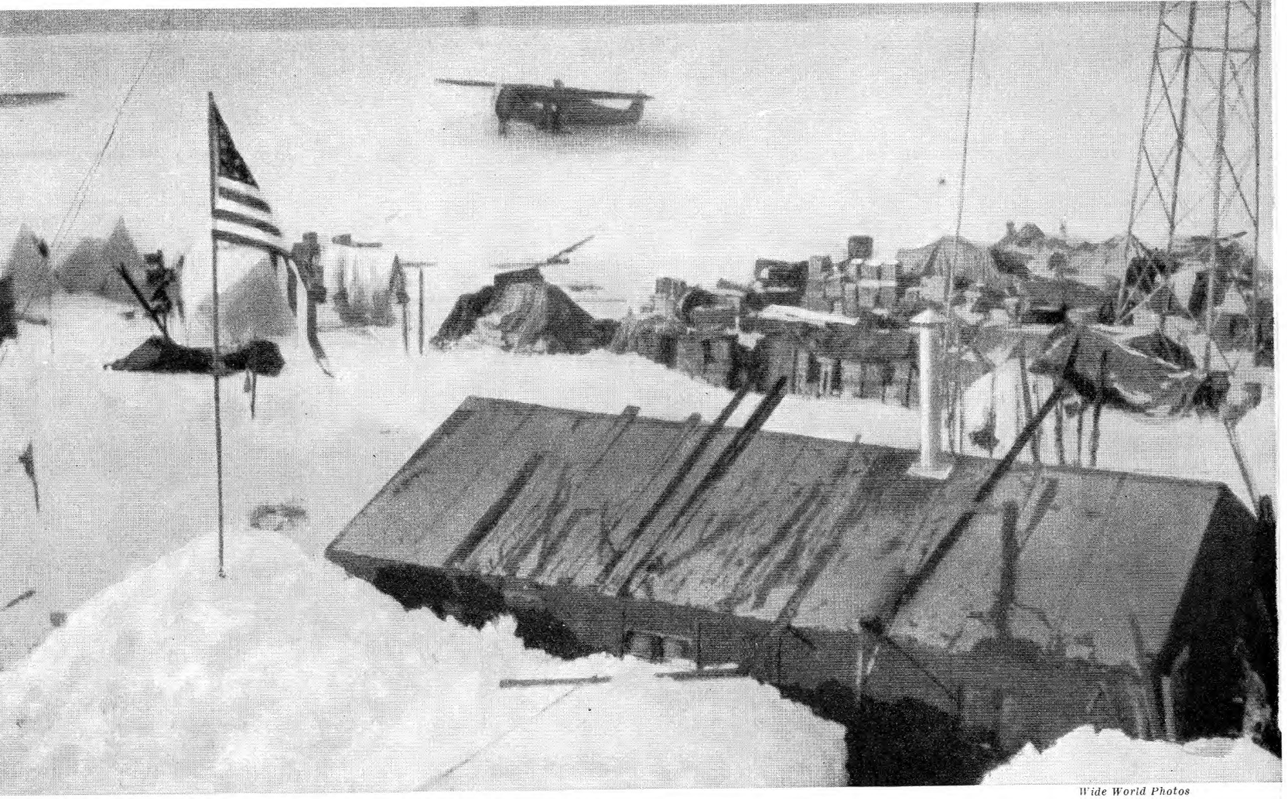
Other high-speed monoplanes of the same class include one by the Supermarine (Vickers) designer, Mr. R. J. Mitchell, and naturally the aeronautical world has been all agog to see what the famous designer of Schneider Trophy winners, and also of big flying boats, has produced in the single-seater fighter class. Secret new designs for the Air Force, also in the heavy bomber class, are being produced; in one case a big Fairey monoplane was ordered by the Air Ministry while it was yet in the drawing-office stage.

Looking abroad, much the same stage in development is to be observed. In the case of the United States, new fighters proved on trial to lack the necessary speed and were sent back. They were, indeed, no faster than, if as fast as, some of Uncle Sam's new heavy and medium bombers, and, therefore, could not be regarded as fulfilling the essential need, namely, that of ability, by reason of superior speed, to challenge the bomber, and to give or to break off battle at will.

In point of fact, nowadays, the design of aircraft is on much the same level in all the principal aircraft-producing countries. Whilst surprise is not impossible, and unexpected invention may at any moment afford a sensational advance, the interchange of technical knowledge is so general that such surprises become more and more improbable. Accordingly, 300 m.p.h. air fighters are on their way in France, Italy and Germany. France has a new type with wings which can be expanded for take-off and landing, and telescoped to some extent, reducing the wing-area, for high speed. With this type of machine a speed of 320 miles per hour is anticipated.

In reference to maximum speed it should be borne in mind that this is merely a standard and not a practical operational speed. It cannot be maintained except for a short period, for it is very extravagant of fuel, and trying for the engine.

Even when taken as a standard of reference it has not much meaning unless it is the maximum speed attained with full load, and there is plenty of evidence showing that in reports of foreign aircraft performance the maximum speed is usually that attained with light load and without the military equipment, which always provides some air-resisting excrescences. As stated elsewhere, moreover, the maximum speed is not attained at the same time as the greatest range possibilities are exploited. The greatest range attained is that possible at cruising speed or less. High performance is the *sine qua non* of modern military aircraft design, and constant progress is being made in this direction. Heavy armament, too, is a feature of many new types, particularly in machines constructed abroad.



Wide World Photos

MAKING READY FOR THE FINAL TRIUMPH

The distinction of being the first aviators to reach the South Pole is shared by Bernt Balchen, Harold I. June, Rear-Admiral Richard Byrd and Captain A. C. McKinley, who flew there in a Ford monoplane (piloted by Balchen) on November 28–29, 1929. The flight was the climax of a six months' stay at "Little America," a base established on the ice barrier by Ross Sea. Here are two scenes at "Little America." Above, the mess hall in course of construction, with one of their four aircraft in the background. Below, the Ford monoplane being dug out from the snow



Air Stories: Tragic and Romantic. 7

FIRST FLIGHTS OVER THE POLES

By Capt. J. A. Sinclair

This series of chapters would be truly incomplete without an account of the attempts to fly over the North and South Poles. Although not at the first attempt, both Poles were crossed. Byrd and Amundsen reached the North Pole, the Norwegian explorer being only two days behind the American, and Byrd flew over the South Pole

ALTHOUGH several earlier attempts to navigate aircraft over the North and South Poles had been made, it was not until 1926 that the northern pole of the earth was successfully traversed by an aeroplane. In 1897 the explorer Andrée, with three companions, drifted slowly away from his base at Spitsbergen in a balloon fitted with a sail (*see* page 705); in 1907 Wellman, a wealthy American, financed the building of an airship to Vaniman's design and an attempt was made from Spitsbergen to fly to the North Pole, but this also failed. Still later, in 1925, a survey of the Arctic regions was carried out by Amundsen and his companions in Dornier-Wal flying boats. Amundsen was convinced that the best possible type of aircraft for such an exploration was an airship, and he returned to Europe and organized an expedition.

But the honour of discovering the North Pole by air was snatched from the great explorer's grasp by almost a few hours, for on May 9, 1926, Lieutenant-Commander R. E. Byrd, acting as navigator, and Floyd Bennett, the famous American airman, successfully navigated the North Pole and returned to their base. Before 1 a.m. on the morning of May 9 the special Fokker (Type F.VII) monoplane—a tri-motor with three 230 h.p. Wright engines—named "Josephine Ford" was prepared for its epic flight. Measuring nearly sixty-five feet across the wing, the craft was loaded with sufficient petrol for a flight of more than twenty hours. The two famous men, muffled with additional coats and other clothing, took their seats. Although the machine had been fitted with skis in place of ordinary landing wheels, considerable difficulty was experienced in getting it off the ice, but this was eventually accomplished and the desolate, uninhabited, snow-covered ice fields echoed to the purr and vibration of the monoplane's engines.

A few minutes after nine o'clock in the morning the machine was passing over the North Pole, and with a series of steeply banked turns the pilot celebrated the flight and then turned his Fokker towards its base—Spitsbergen. About four-thirty in the afternoon the craft hove in sight, the small staff came out to greet the men safely back, the machine skidded across the frozen snow and came to a standstill, having completed a non-stop flight of nearly sixteen hours and covered a distance of more than 1,600 miles.

Two days later, on May 11, the Italian semi-rigid airship, Norge, under the navigation of Amundsen, passed over Spitsbergen towards its goal. The next day the North Pole was reached and numerous photographs and sketches made, and then the journey was carried forward until a landing was safely accomplished at Teller, Alaska, on May 14. (*See* pages 549–54).

A further flight over the North Pole was carried out in 1928. This was the successful attempt of Sir Hubert Wilkins and Lieutenant Eielson to fly from Alaska across the axis of the earth to Spitsbergen. In April the two airmen arrived at Point Barrow with their single-engined 230 h.p. Wright motor Lockheed Vega monoplane. The craft was prepared for its flight and on April 15 took the air. In recording these first Arctic and Antarctic flights it is well to remember that they were carried out under very difficult conditions, and that numerous special arrangements had to be made in order to overcome climatic conditions.

There was no question of being able to put down at any towns en route;

SWIFT WINGS ACROSS THE SNOWS

With Floyd Bennett as his pilot, Rear-Admiral Byrd achieved one of his ambitions when he flew over the North Pole in May, 1926. Using a three-engined Fokker monoplane, fitted with runners instead of landing wheels, he left Spitsbergen, reached the Pole, circled round and returned to the starting point, the whole flight occupying 15 hours 51 minutes. The distance covered was 1,600 miles. Below, the Fokker leaving Spitsbergen

Wide World Photos





Wide World Photos

VALIANT VOYAGERS' RETURN

When Bennett and Byrd came safely back to Spitsbergen after their aerial journey to the "top of the world" their friends were overjoyed. Here we see the late Roald Amundsen, the Norwegian explorer, embracing Byrd after the flight. Amundsen lost his life in 1928 in an endeavour to save General Nobile, as described in page 554

there were no supply stations if the petrol supply failed. In case of a forced landing it was more than possible that the adventurers would die of starvation. All these matters had to be faced and the risk of disaster minimized, and, when reference is made to the machines being prepared, it must be recalled that they carried, not only their full load of petrol and oil, but many pounds of other goods and materials which might be useful and give them some chance in the case of a forced landing. Across the snow-capped glaciers the craft sped upon its way, for nearly twenty hours the engine purred —across the Pole and towards their objective—and then, when it seemed that the flight was accomplished, disaster overtook them and they were forced to land 50 miles from their goal.

For four days they were storm-bound, but happily on the 20th they were discovered and rescued by a search party. So ended the second flight across the North Pole. Quite apart from the country over which the flight was made, this last flight was, despite the forced landing, an outstanding feat of that year, if only for the engineering achievement which enabled a single-engined machine to remain in the air for just over twenty hours, thus enabling the occupants to cover a distance of more than 3,500 kilometres.

Undeterred by the climax to his Arctic flight, Sir Hubert at once commenced preparations for an attack upon the South Pole and secured the support of Mr. W. R. Hearst, the American newspaper owner. The party included the pilot Eielson. Two Lockheed Vega monoplanes, fitted with skis and built with an enclosed cabin, were taken to Deception Isle, which was to form the principal base from which the expedition worked. On December 19, 1928, the first long flight in an aeroplane over the Antarctic regions was carried out by Sir Hubert and Eielson. A distance of slightly over 1,900 kilometres was covered, a circular trip over Graham Land establishing its insular character. On January 10, 1929, a further flight of 800 kilometres was made round the Isle of Deception, but it was eventually found impossible to establish an efficient base at this point and the expedition returned to the United States.

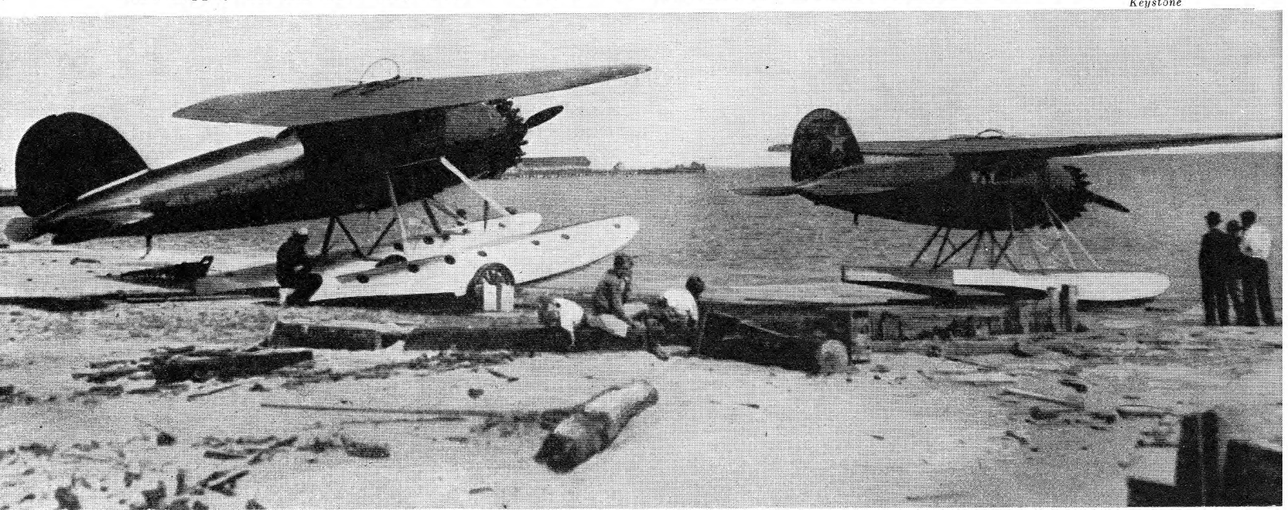
The honour of making the first actual flight over the South Pole belongs to R. E. Byrd. An expedition was formed and established its base near an old base of Amundsen's, which was appropriately named "Little America." Four aeroplanes were taken out: a small G.A.C., fitted with a 110 h.p. engine; a Fairchild monoplane, fitted with a 450 h.p. engine; a Fokker monoplane fitted with a 450 h.p. engine; and a large tri-motor Ford monoplane, similar to that used on the flight over the North Pole. This last machine was entirely built of metal. Twenty-four men formed the staff and included four aeroplane pilots and Bernt Balchen, who had been Byrd's companion in his attempt to fly the Atlantic.

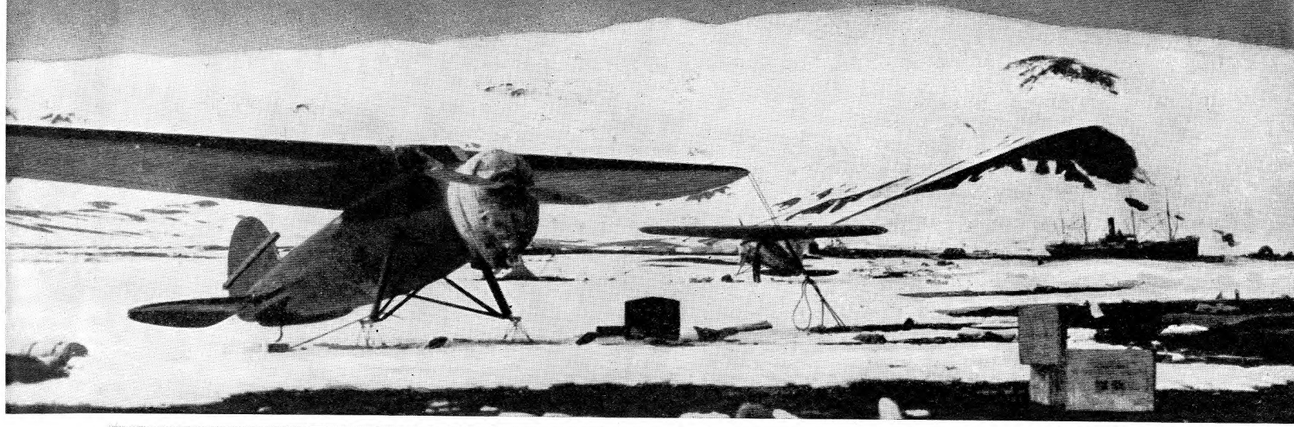
On January 28, 1929, the Fairchild monoplane, with Byrd, Balchen and a radio-telegraphist, Harold June, carried out a flight and surveyed Alexandra and Nunatak—which had been discovered by Captain Scott. On February 19 and 20 the Fairchild monoplane and the Fokker monoplane, flying in company,

CRAFT THAT CROSSED POLAR WASTES

These Lockheed "Vega" monoplanes were used by the Australian explorer Sir Hubert Wilkins on his North and South Polar flights in 1928. Lieutenant Carl B. Eielson acted as pilot. The North Polar exploit started at Point Barrow, Alaska, and finished at Spitsbergen. In his second flight Wilkins flew from Deception Isle to Graham Land and back

Keystone







Photos: Topical

AFTER HISTORY HAD BEEN MADE

Among modern explorers Sir Hubert Wilkins and Lieutenant Carl B. Eielson are held in high esteem, for their flights made in the Arctic and Antarctic in 1928 were brilliantly carried out and provided much valuable data. The photograph above shows Eielson (left) and Wilkins (right) after they had concluded their epic aerial survey in the South Polar regions in January, 1929

POLAR PENETRATION

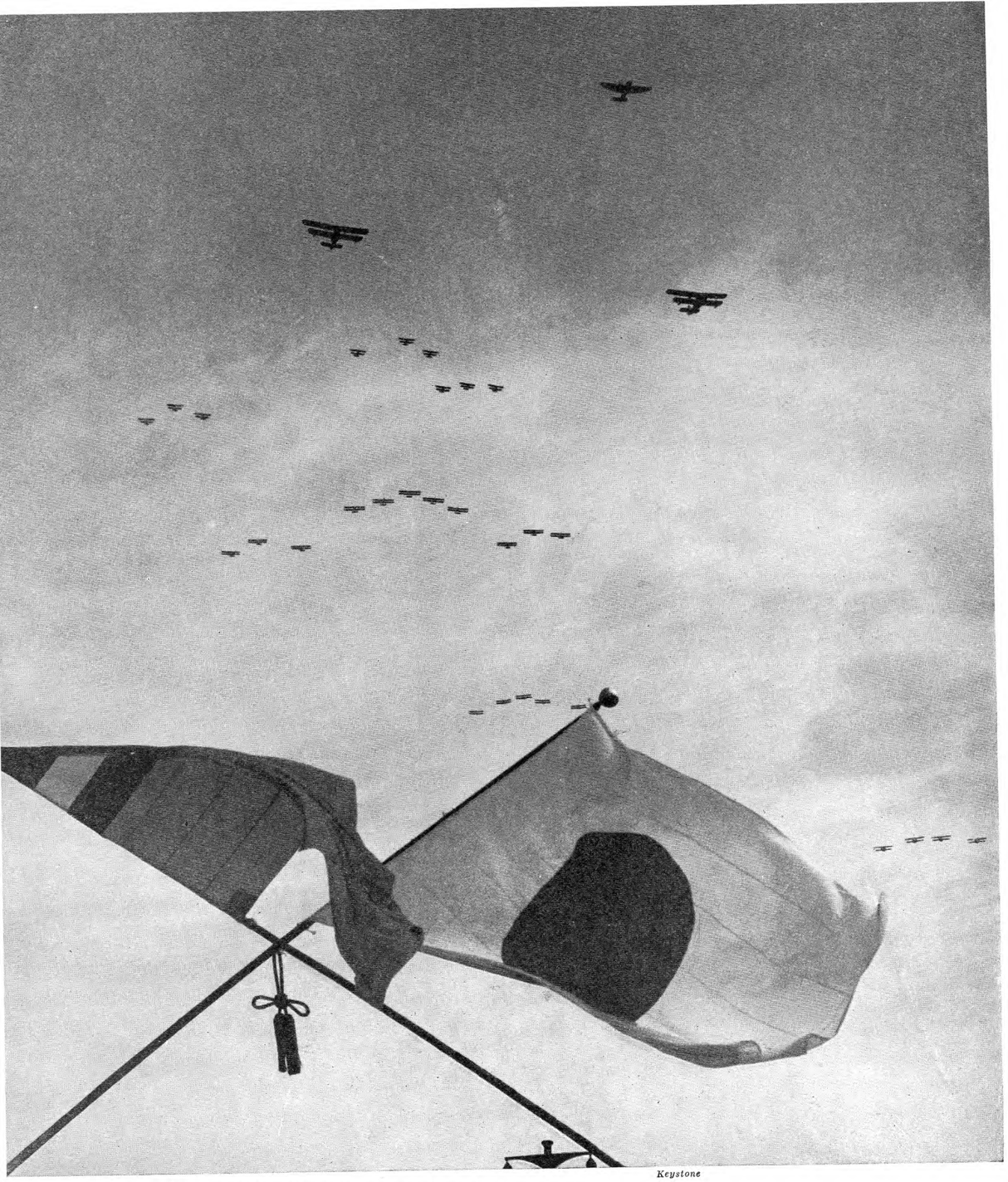
Here are seen at Deception Isle the Lockheed "Vegas" used by Sir Hubert Wilkins during his flight over South Polar regions. The machines, fitted with skis instead of landing wheels, had single 230 h.p. air-cooled Wright engines

photographed the Rockfeller Mountains and surrounding districts, with a view to establishing a further base.

A fortnight later, on March 8, Larry Gould, the geologist of the party, flew with Balchen and the wireless operator, Hansen, on the Fokker monoplane, and made a further survey of the Rockfeller Mountains and discovered their structure. The machine was, however, forced down through bad weather, and they were lost until March 16, 200 kilometres from their base. Byrd and the telegraphist, June, found them on the 18th, and on the 22nd the party was back at "Little America." The long winter made it necessary for work to be confined for some months to the base, and during that time Byrd and his companions were developing films and photographs.

In November the weather changed, and on the 7th it was possible to move the aeroplanes from their positions and to prepare them for the long flight. On November 28 the great flight to the South Pole started. Provisions for three months were stored aboard the Ford tri-motor plane; tanks were filled, and the crew, Byrd, Balchen, June and Mac Kinley, the camera man, were ready.

Experience had been gained in handling the large machines on the slippery surface, and there was little difficulty in getting the heavily laden machine into the air. The course was set. With engines purring and the great expanse of snow-covered hills and mountains below them, the adventurers flashed upon their way. For hours the flight continued, and then, as the Pole was reached, the machine was navigated in a circle; the camera man worked at his machine, and the nose of the craft was directed homeward. On November 29 "Little America" was reached—the South Pole had been navigated by aeroplane.



Keystone

ABOVE THE 'LAND OF THE RISING SUN'

During the reception of the Emperor of Manchukuo at Yokohama, large formations of aircraft of the Japanese Naval Air Force from the air-base at Tateyama flew past as a modern "guard of honour" for the visitor. These aircraft included, as may be seen above, large flying boats, fleet fighters and bombers—a formidable display of Japan's naval air strength. As in the U.S.A., there is no separate Air Force in Japan, but both the Army and Navy have air arms. The flag on the right in the foreground of the photograph shows the Japanese national emblem

Aerial Armadas in Being. 10

SKY FIGHTERS OF THE EAST

By Major Oliver Stewart, M.C., A.F.C.

The air strength of Japan, and to a lesser extent of China, is discussed in this chapter. The conclusion reached is that Japan already possesses a strong air force and must in the near future, if not at present, be regarded as one of the world's great air powers, just as she is one of the world's great sea powers

AVIATION is a development of the Western World and the focus of progress has always been in the West. Yet there is plenty of evidence that the East is gradually learning its full significance, both for peace and war, and that it is making considerable efforts to catch up its handicap and to establish itself on an equal footing with the parts of the world where aviation had its beginning. Among the Oriental countries which have taken to aviation the leading one is Japan, and it is at the work that has been done there that I shall first look.

Students of Japanese life are fond of saying that the Japanese are quick to imitate, but slow to originate, at any rate in mechanical matters. The method they have used to establish themselves among the leading air powers of the world tends to confirm this theory. For they began by obtaining from the leading aircraft-producing countries—from the United States, Great Britain, France and Germany—aircraft of suitable pattern, and then they set to work to produce them under licence. In this they achieved considerable success, and they were able to turn out aeroplanes which fulfilled the strength and other requirements to which the prototypes were built.

While this process was going on, the Japanese sent technical envoys all over the world. These envoys were for a long time a familiar sight at aerodromes in Britain and on the Continent, and no technical demonstration and no aeronautical test of importance took place without there being some of them there to witness it and to take notes. By their industry in this examination of world progress in aeronautics the Japanese built up for themselves a considerable fund of knowledge.

This knowledge they are now using for their own purposes, and it seems that they have succeeded in forming an air force which must be regarded as reaching a fairly high level of quality and a very high level of quantity. Its first line strength is placed by the statistical department of the United States chamber of commerce as high as 1,850 aeroplanes. British estimates have been a good deal below this, and so have French. Probably 1,200 first line aeroplanes is as near the actuality as

INTO THE BREECH

Taken at the Tokorozowa Flying School of the Japanese Air Force, the photograph below shows a young gunner aligning the ring and bead sights of his efficient-looking camera-gun mounted on a Scarff ring. This photograph should be compared with that of the R.A.F. gunner, using a very similar weapon, in page 221

Wide World Photos





Wide World Photos

INSTRUCTION MOST ELEMENTARY

Today, all instruction at Japan's flying schools is given by Japanese officers, and not by foreigners as was the case only a few years ago. Above, a pupil being taught the "feel" of the controls by using dummy wooden joystick, rudder-bar and throttle; and, on the right, an instructor giving orders to a pupil up aloft by wireless telephone

can be ascertained from existing data. There must be added to this number a very considerable fleet air arm, and this is an aspect of Japanese air development of which too little note has been taken by the authorities in Britain. Japan, although her air force is so much smaller than that of, for instance, France, has a fleet air arm of about four times the size. Indeed, there is reason to suppose that the Japanese are the first people to think of the conception of a marine air arm, that is to say, a striking force of size and weight based wholly on ships.

Actually, Japan has eight aircraft carriers of various sizes and at least two more are under construction. The bigger ones carry the same complement of aircraft as British aircraft carriers. The smaller ones are seaplane carriers, and they may take only sixteen machines each. In addition to these regular carriers, several cruisers in the Japanese navy carry aeroplanes.

As for the Japanese aeroplanes themselves, these are now made in State aircraft works and by such large Japanese manufacturing companies as Mitsubishi. Engines are built under licence, both British and German designs being extensively used. In general terms, the organization of the Japanese air force somewhat resembles

that of the American. There are separate military and naval aviation authorities, but the degree of co-operation between the two is increasing.

Interest in air defence has been stimulated in Japan during the two years 1934–35 by air raid drill and air manoeuvres over the cities, and it seems clear that the Japanese will continue and accelerate their programme of aerial development.

From a technical point of view, they still have some distance to go before their original machines can hope to compete in performance with the British, American, French, Italian or German, but it is said that a programme of attacks upon world records is contemplated to encourage further technical progress.

The Japanese make good pilots, and in their operations in Manchukuo they showed themselves capable of acting with the requisite discipline in the face of an enemy. In fact, if the position is reviewed in general terms, it may be said that the Japanese air force is one which is likely to maintain itself in a position among the leading half dozen of the world, and that it may at any moment accelerate its rate of technical progress. Especially important are the uses to which ship-based aircraft are put by the Japanese and the value which the Japanese naval authorities evidently attach to them.

Compared with Japan, the air strength of China is almost negligible. First line strength figures are impossible to give because the aeroplanes are of so





Wide World Photos

AMERICA IN CHINA

The aircraft manufacturers of the United States have found a profitable customer in China, which has no aircraft industry of its own. Among the machines purchased by the Chinese Government is a large Curtiss-Wright "Condor" biplane for bombing or troop transport. The "Condor" is seen at St. Louis before leaving for China in charge of the famous pilot, Captain F. M. Hawks

many different types that any figure would be more than ordinarily misleading. The Chinese use aeroplanes supplied by the United States, France, Italy and, to a smaller extent, Britain. So far as Britain is concerned the chief part played in Chinese aviation is in the provision of suitable instructors and ground engineers.

At Hong Kong, for instance, there is a flying training school which is staffed by British pilots. The aerodrome here is an area of land reclaimed from the sea, and was bought by the Hong Kong government for an aerodrome. Avro Cadets are used for the training, and pupils come there from all over China. One of the instructors at this aerodrome has given it as his opinion that in "hands," or ability to handle the aeroplane, the Chinese compare well with Europeans. But in "head," or the point of view from which they fly and appreciate their own capabilities in handling the machine, they are inferior to the Europeans. Another flying school, at Hangchow, is run by Americans.

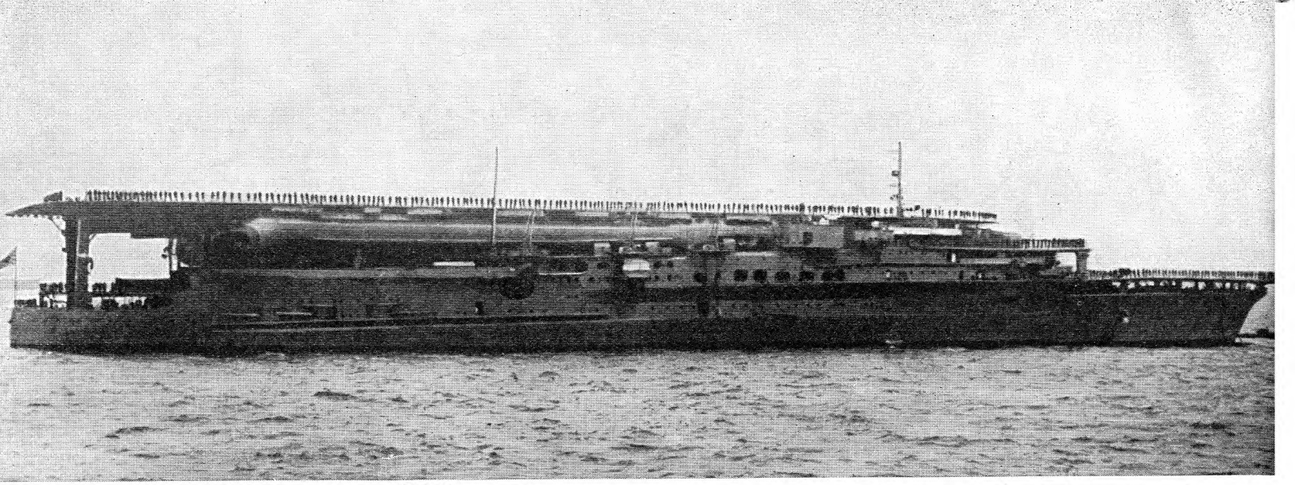
Asiatic countries such as Persia, Siam, Afghanistan and Turkey are at present equipped with air forces so small as to be of little account, although in Siam there are signs of a gradual quickening of interest in aviation.

If one seeks to sum up the position of aviation in the Asiatic countries one must conclude that it is at present not so advanced as in western countries, and that it will be some time before it can hope to catch up—at any rate, on the technical side. But that some of the Asiatic countries have a genius for large-scale series production of all kinds of machinery cannot be questioned, and it may be that this genius will lead eventually to the establishment of very large air forces.

Had she a large commercial air fleet Japan could probably compete with any country in rapidity of production of both air-frames and aero-engines. Even as it is, she could, in a short time, treble the first line strength of her air force and provide it with the appropriate number of immediate and stored reserves. She could also probably turn out pilots and gunners quickly. The Japanese seem to have genuine flying aptitude and they very soon become proficient.

The possibility exists, therefore, of the creation of an enormous air force in one of the Asiatic countries, and, if that were to occur, it is conceivable that pressure might be exerted upon western countries through the air. That is speculation. What is not speculation is that the Japanese already have an air force of large size, and that they are making every effort to amass all the technical and scientific data which is available in Europe and America and to put it to practical use.

Where an invention of outstanding merit is made in a foreign country, the Japanese are quick to seize upon it and



Keystone

FLOATING 'DROME

Japan, in her particularly insular position, has long understood the importance of a strong Fleet Air Arm, and the aircraft carrier "Kaga," seen above, was completed in 1920. Since then the number of her sea-going aircraft and carriers has been increased considerably

to obtain a licence to use it. An instance of this is to be found in the wing slot, which is an English invention and which, directly it had proved its worth for securing increased safety in the air and for increasing the stability of the machine under low-speed conditions, was taken up by the Japanese.

No invention or technical development has occurred in Britain without it being watched by Japan. The result is that the technical position of the Japanese is improving and that the time when they will be producing machines as good as those produced elsewhere draws ever nearer.

China has far to go before it possesses an air force worthy of the name; but its recent experiences in the conflict with Japan have turned attention towards air force equipment, and numbers of aeroplanes have been sold by the Americans and others to the Chinese.

There is one thing about the Asiatic nations, however, which must be borne in mind when any attempt is made to assess their air strength. Their commercial air lines are relatively undeveloped, and this means that they have no backing from an industry supported by any other means than that of armament making. It is stated in the chapter on the United States air force that one of its greatest assets is the large and efficient industry, based upon commercial air lines, which stands behind it. In the air forces of the Asiatic countries I would say that their greatest weakness is the absence of any highly developed commercial aviation and, therefore, of any large independent aircraft industry.



Wide World Photos

AUTOGIRO IN THE EAST

Señor de la Cierva's wonderful invention, the Autogiro (see pages 333–8), has already found favour in Japan, and here we see an American-built type at a Japanese flying-school. A pilot is seen inspecting the rotor-blades of the machine before a flight. It is an indication of Japan's progressive outlook that her military airmen are trained in the piloting of this form of aircraft as well as the orthodox type of machine

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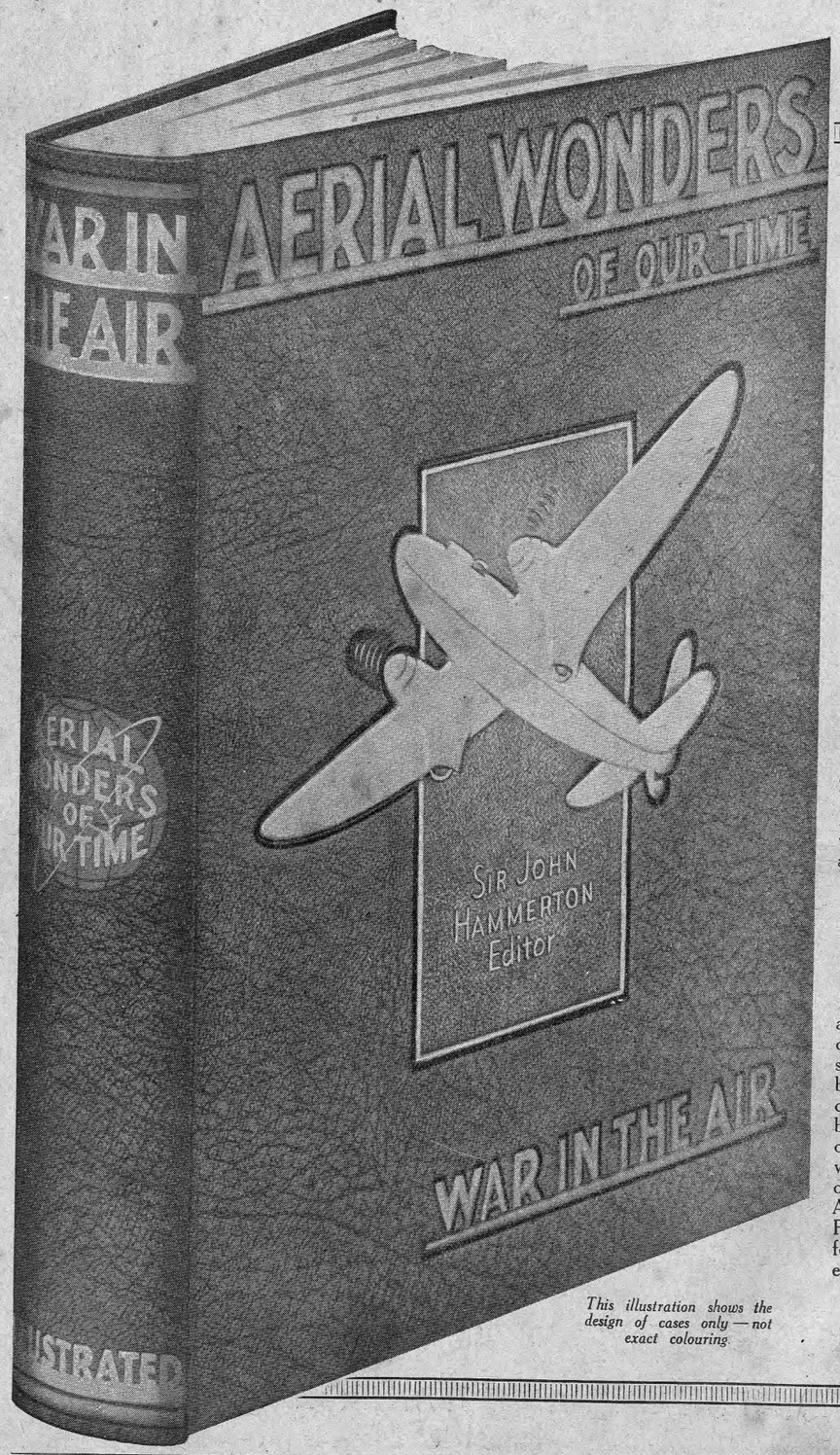

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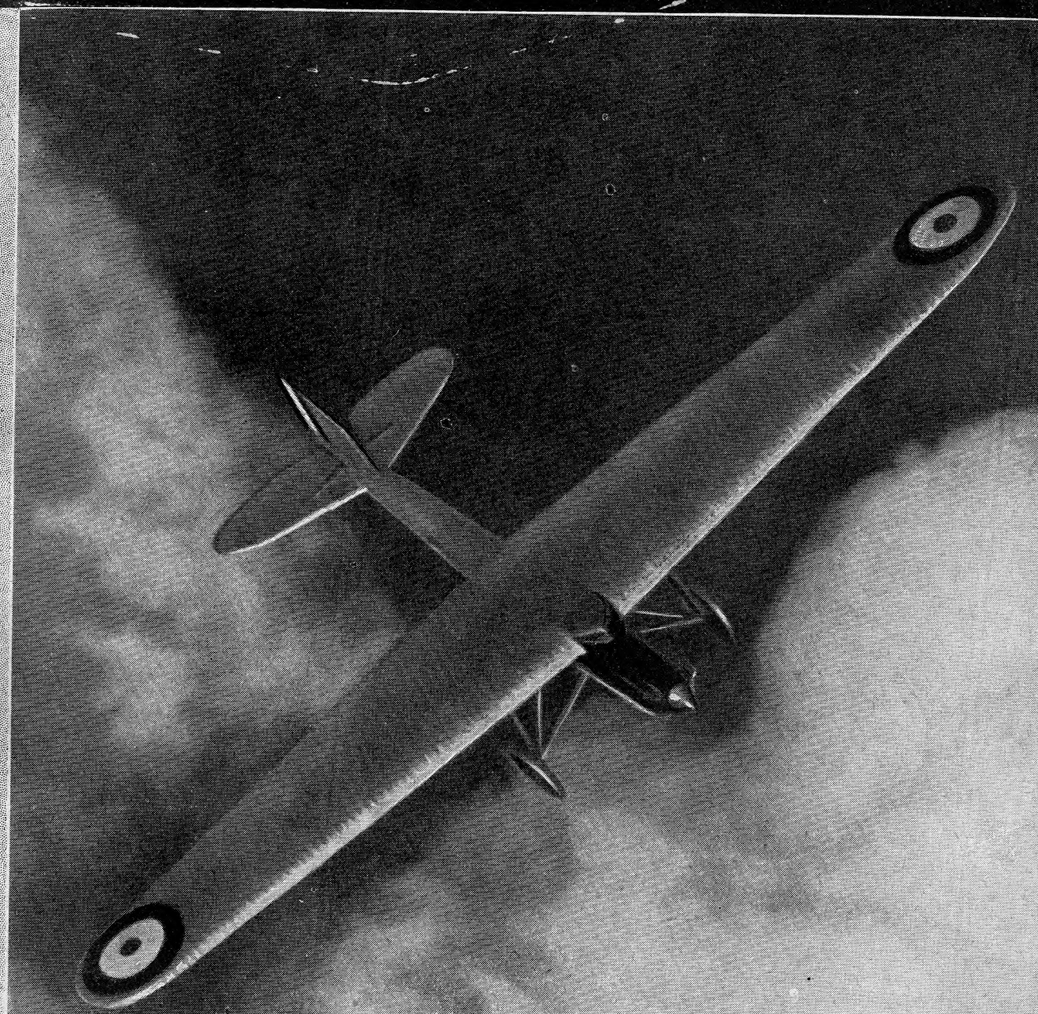
Part 25 — Final Part with General Index — SEVENPENCE

WAR in the AIR

AERIAL WONDERS OF OUR TIME

SIR JOHN HAMMERTON
Editor



Editorial Eddies

John Carpenter House, London, E.C.4.

IT is with a feeling of some regret that I find myself writing these editorial notes, for with this Part WAR IN THE AIR is concluded. Throughout its period of publication it has been my aim in producing this work to cover, as far as possible, every aspect of the science of aeronautics. It has been an involved task, involved to an extent that has surprised me, for, so far as the aeroplane is concerned, I have always had in mind the fact that I have been dealing with a subject the history of which spans little more than thirty years. Yet in that short space of time the conquest of the air has been pressed forward at an ever-increasing rate, so that I and my staff have had an almost bewildering number of facts to sift and collate as week by week the chapters were made ready for publication.

THIS endless and rapid progress has been continuing even while WAR IN THE AIR has been produced, so that inevitably there will come a time in the not far-distant future when further wonders will have to be recorded in the amazing annals of Man's mastery of the air. The evolution of the aeroplane has, indeed, been one full of romance, in which Man has shown an ingenuity and a tenacity and courage of very high order. Who can read of the great pioneers of flight without some feeling of admiration? Who can turn to the records of that other generation of flying men, the War pilots, the "aces" of the belligerents of the Great War, and not be thrilled at their unsurpassed gallantry? And when we look at the developments made in more recent years we can still regard the aeroplane with wonder, though it may have become part of our ordinary life. The streamlined, swift and sleek aircraft that passes over city and hamlet everywhere and every day is a symbol of our modern times.

ON turning back and looking through the pages of this work, and especially at the illustrations, the immense strides that have been made in the air, even in the last decade, are forcibly brought home to the reader. Those England-Australia flights, for instance. It is only eight years ago that the Australian airman, the late Bert Hinkler, who, it is agreed, was one of the finest pilots that ever lived, set the world talking by flying from England, single-handed, to the land of his birth in 15½ days. Six years passed and then C. W. A. Scott and T. Campbell Black made a flight from Mildenhall, in Suffolk, to Melbourne in under three days. How they made this truly astounding epic of the air is told in the final chapter of this Part. Going back into the past to the real pioneering days of aviation, to make further comparisons, we find in 1909 that a flight, since made many thousands of times, stirred us to great heights of enthusiasm, for it brought to Louis Blériot, the pilot who achieved it, a prize of £1,000 and placed him for ever amongst the select and distinguished group that may be called the masters of the air.

THAT cross-Channel flight of his, made on a July morning twenty-seven years ago, occupied something over half an hour, and a little calculation will show that in that same time Scott and Black, who would have then scarcely settled down at the outset of their record dash across the world in 1934, would have covered nearly 100 miles. One may well ask where and when will this astounding aerial progress end? For aircraft grows faster, surer and more powerful with every year of its existence. It has penetrated now to the farthest corners of the earth and there must be comparatively few mortals who have not yet seen an aeroplane. That airmindedness is spreading throughout the world is a fact that has been clearly revealed to me by the correspondence that has come to hand from subscribers to WAR IN THE AIR, and I have been impressed in finding how well-informed my Overseas readers are on the subject of flying. I have by me as I write a letter from a schoolboy in Hong Kong which shows his unbounded enthusiasm for aviation. He tells me of the splendid aerodrome and flying school at Kai Tack, near the old Kowloon City. The Chinese, he informs me, have long used a phrase—he writes that it is to be heard frequently in their country—"As fast as the aeroplane."

AS far as Britain is concerned there will be no lagging behind in the general trend forward in aeronautical progress during the present year, for many plans are afoot and many projects already under way. The Short-Mayo composite flying boat (described in Part 23) will be launched and tried out on an experimental flight to Canada, and several new high-speed commercial machines will make their appearance. Air transport both within the British Isles and over the Empire routes will be greatly expanded and speeded up and this will necessitate new airports and the reorganization of several of those already established. Plans have already been prepared for a huge Empire air base at Portsmouth, and it is estimated that this will be ready by the end of 1936. Meanwhile, a large percentage of aircraft manufacturing concerns are working at high pressure to complete contracts placed with them by the Air Ministry for new machines with which squadrons of the Royal Air Force are to be equipped or re-equipped. This heavy call by the Service on the production resources of the aircraft industry, it has been suggested, will have a serious effect on the civil branch of British aviation as it is considered likely that the private flyer and his needs will be neglected. But there are no signs of this at present, and, indeed, it seems highly probable that the really cheap and economical light aeroplane will at last find its place on the market during the current year.

TWO makes of machines of the ultra-light type have already proved their capabilities, one the little two-seater Aeronca, the other the B.A.C. Drone. There is, I am told, a definite and growing demand for these small aeroplanes and there is certainly a great attraction in a craft which is so simple that it can be maintained in flying trim by its owner and costs but 2s. per hour in running costs when flying at 60 m.p.h. Such is the claim of the manufacturers of the Drone. As for the Aeronca, the flight from Hanworth, Middlesex, to Johannesburg, made during February last by Mr. David Llewellyn, proved that this 40 h.p. "baby" is no mere toy. Llewellyn's flight was not without incident. On one occasion, in order to avoid a storm that lay ahead, he landed in a small clearing 6,000 feet above sea level amidst forbidding mountains. The storm passed and pilot and plane resumed their journey. Llewellyn made his flight solely for business purposes and as a demonstration of the little machine's practical use. Both the Aeronca and the Drone are dealt with in Part 22 of WAR IN THE AIR.

For Publisher's Special Binding Offer, see Back Pages

War in the Air. 25

FLYING TO VICTORY

By Capt. J. B. Sterndale Bennett, M.C.

The final phases of the War on the Western front were marked by increased activity on the part of the Royal Air Force. Some notable incidents of this closing period are here related, including the deeds that won the V.C. for Capt. A. W. Beauchamp-Proctor. This chapter completes the series, which has described the air fighting of nearly four and a half years

THE Royal Air Force, in which were amalgamated the naval and military branches of the flying services, came into being on April 1, 1918. It was as such, therefore, that the British air arm played its part during the concluding months of the War.

The intervening period between the successful German attacks of April, 1918, and the launching of the British and French offensive of August was characterized by a good deal of intensive aerial fighting. The tendency was for the formations to become larger and larger. A wave of protectiveness spread over the German Flying Corps, and increasingly they endeavoured to ward off the attacks of low-flying aeroplanes on their infantry. This primary duty was to become more urgent as local retirements developed into a general retreat. As for the increase in the size of the fighting formations, this from the British point of view often defeated its own object. The Germans were not anxious to seek fight on equal and certainly not on unequal terms. It was often necessary to send out deliberately weakened formations to tempt them into the air.

As had not seldom happened before, when the great attack was launched on August 8 the weather defeated the elaborate programme laid down for the Royal Air Force. Mist obscured the earlier stages of the advance, but this was so successful that the infantry and artillery missed little from lack of aerial co-operation. Not until ten o'clock in the morning did the fog clear sufficiently for the low-flying aeroplanes to leave the ground, carry out their contact work and add to the general destruction. This they very effectively did, successfully bombing trains and troops and transport in retreat. The open nature of the fighting is indicated in the adventures of one British pilot, whose machine was shot down by enemy fire from the ground. He landed ahead of the British cavalry outposts, defended himself for a time with a rifle, and then, being fortunate enough to secure a horse, rode back to his aerodrome.

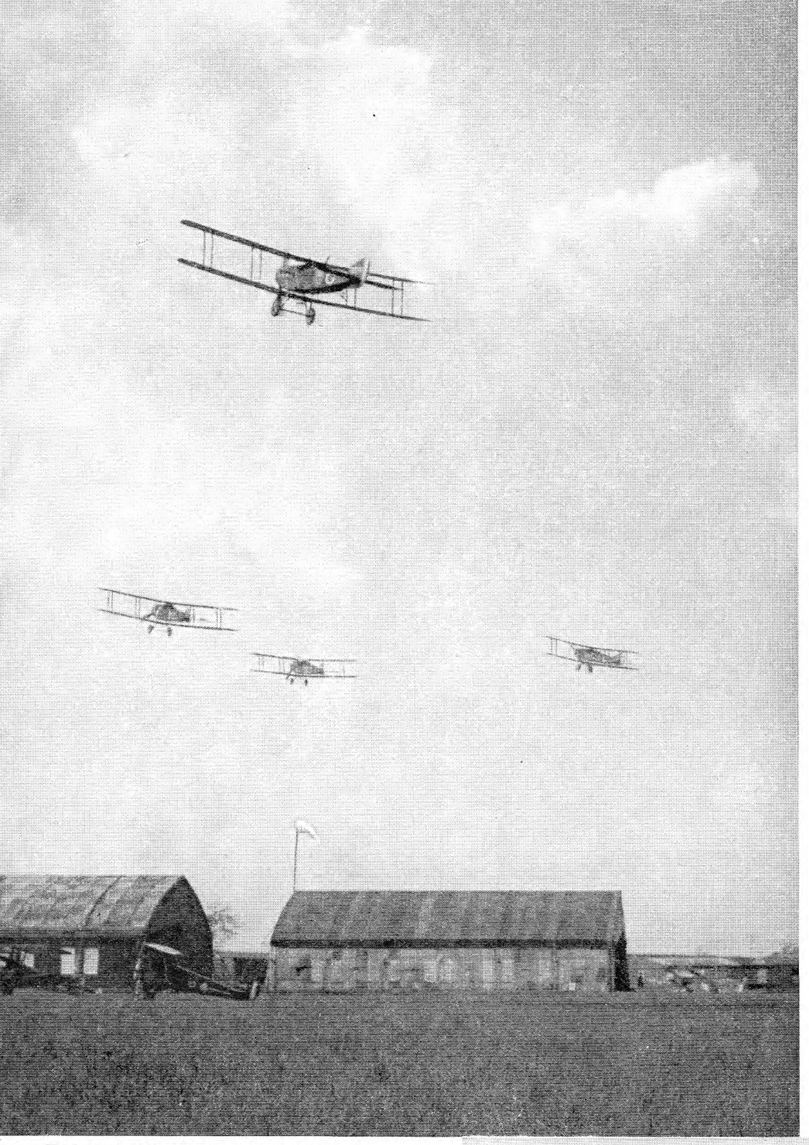
Other work carried out during the period was the bombing of the bridges of the Somme. The Germans were particularly active in attacking the low-flying formations, and these bombing expeditions were often accompanied by fighting patrols. When the cavalry again came into action aerial support

BEFORE THEY 'WENT OVER'

These airmen—pilots and observers of No. 22 Squadron—are handing over the contents of their pockets to the orderly officer before taking off for a patrol over the lines. This was a precautionary measure to prevent information reaching the enemy in the event of a forced landing. The machines are Bristol Fighters

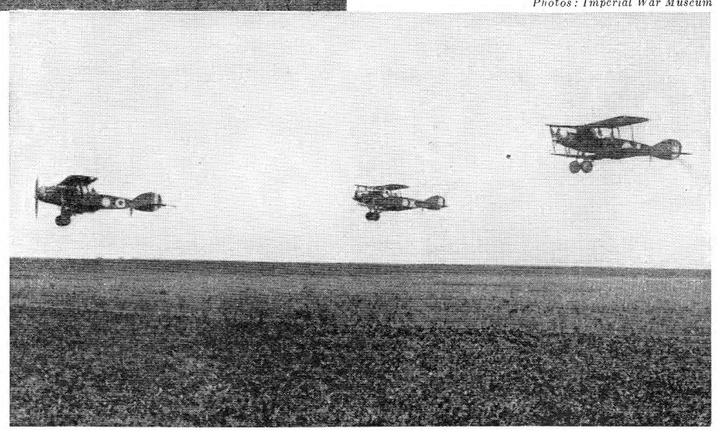
Imperial War Museum





THE FIGHTERS DEPART

In the final victory in the air which came to the Allies in 1918, the Bristol Fighter played a notable part. In these photographs, taken at Verny in June, 1918, some of these famous British two-seaters are seen taking off and climbing into the sky on their way towards the line



dropped his bombs with effect, but when about to return was attacked by six enemy aeroplanes. The "London Gazette" described his further experiences in the following manner:

> Early in the engagement one of his legs was partially severed by an explosive bullet and fell powerless into the controls, rendering the machine for the time unmanageable. Lifting his disabled leg he regained control of the machine, and although wounded in the other leg, he, with surpassing bravery and devotion to duty, manoeuvred his machine so skilfully that his observer was enabled to get several bursts into the enemy machines, which drove them away. Captain West then, with rare courage and determination, desperately wounded as he was, brought his machine over our lines and landed safely. Exhausted by his exertions he fainted, but, on regaining consciousness, insisted on writing his report.

Another distinguished airman whose deeds of valour began to be noticed at this time, deeds so often repeated that they finally earned him the Victoria Cross, was Captain A. W. Beauchamp-Proctor. Of him the "London Gazette" said: "In all he has proved himself conqueror of over 54 foes, destroying 22 enemy machines, 16 enemy kite balloons and driving down 16 enemy aircraft completely out of control." Of the work of this gallant pilot in attacking enemy troops on the ground and on reconnaissance during these concluding months of the War, it was added that it had been "almost unsurpassed in its brilliance."

An excellent example of the changed character of the attacking formations may be taken from the experience in August of the 80th Wing, then under command of Lieutenant-Colonel L. A. Strange. On a raid on Haubourdin aerodrome and station on August 16 no fewer than 65 machines were employed. Machines of two squadrons, Nos. 88 and 92, Bristol Fighters and S.E.5's, were charged with the duty of

Photos: Imperial War Museum

was available for it, and a number of contact patrols were made by No. 6 Squadron. Similar support was afforded to the tanks by No. 8 Squadron, and it was while co-operating with the tanks on August 10 that a gallant action on the part of Captain F. M. F. West earned him the Victoria Cross.

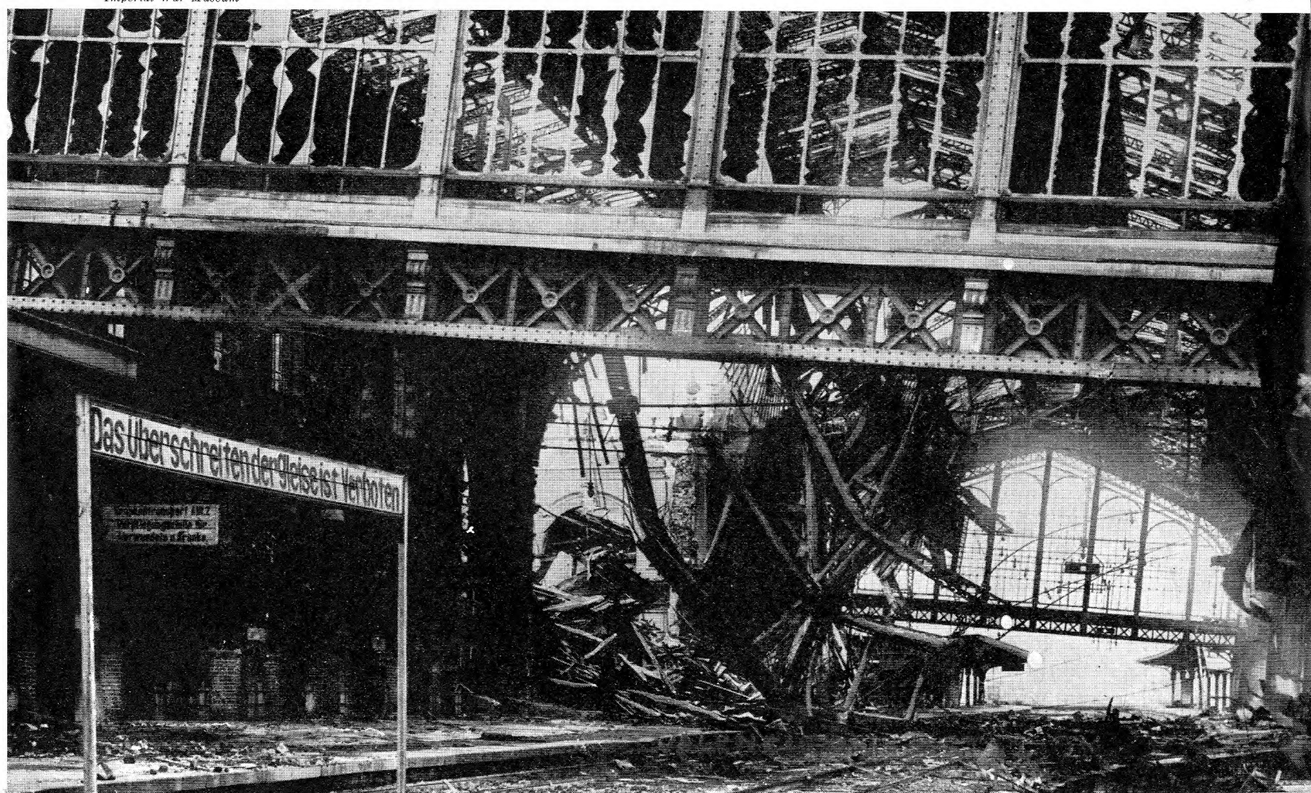
Captain West, flying with Lieutenant J. A. G. Haslam as observer, noticed much enemy activity about Roye, then the objective of the tank attack He

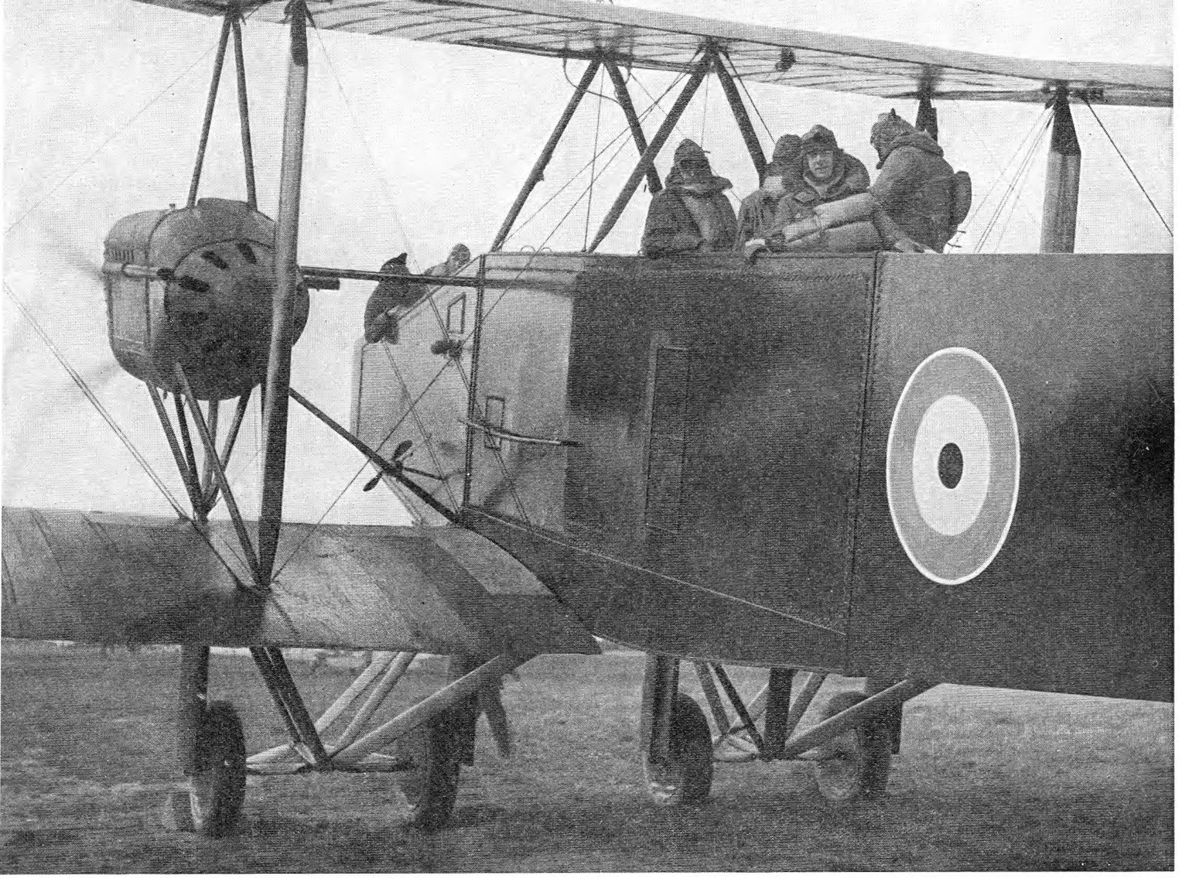


STATIONS SACKED BY FLYING RAIDERS

The devastating power of aerial bombs is vividly shown in these two photographs taken during the Great War after a series of raids had been carried out. In the upper photograph we see all that remained of Guillemont station. Only the splintered wreckage of a line of wagons remains. Below, the tangled debris that once was Valenciennes station. Air raids by day and night were grea ly intensified during the last year of the War, and between January and November, 1918, the R.A.F. dropped nearly 5,500 tons of bombs on enemy territory and positions

Imperial War Museum





BOUND FOR THE B.E.F.

In 1917–18, when the Handley Page o/400 type bomber was put into service in France, it was used extensively for conveying from England pilots urgently needed by squadrons at the front. It was thus the forerunner of the modern troop-carrier. Here is one of these machines with a party of pilots on board at a home aerodrome, prior to crossing the English Channel on its way to the war zone

protecting two others (Camels), which in turn were to fly low and bomb the objectives. The squadron flew at different heights and conformed perfectly to the necessary manoeuvres. The damage they inflicted was very heavy. At least three hangars housing aeroplanes were destroyed and considerable casualties inflicted on the ground staff. The attack on the station was equally successful, and the aerial armada returned without a casualty. The same mass attacks were repeated, a very successful one taking place next day when 106 bombs were dropped on Lomme aerodrome. Sheds, huts and hangars were destroyed.

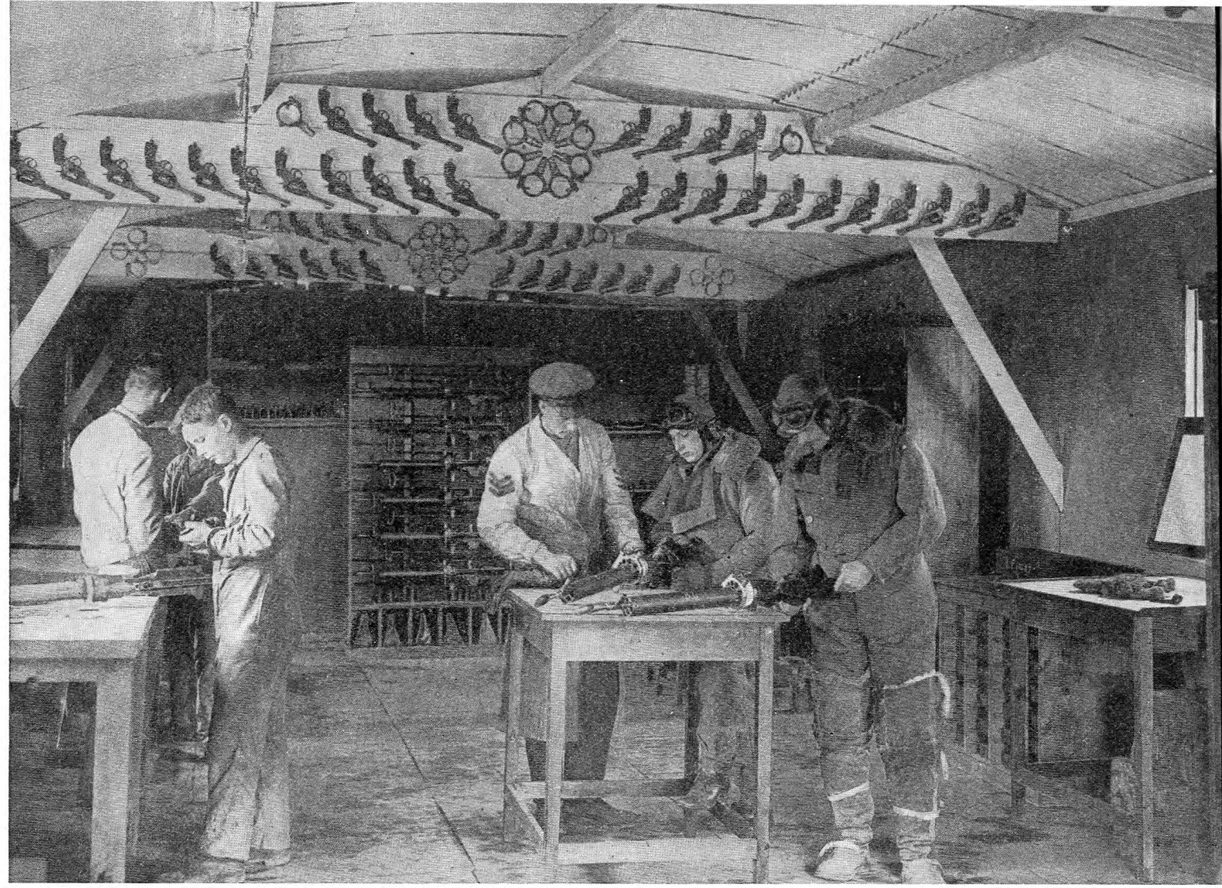
It may be remembered that a service rendered by the Flying Corps in Mesopotamia was the dropping of food on the beleaguered town of Kut, but it is probably little known that the same task was undertaken during the victorious advance in Flanders in 1918. Towards the end of September the king of the Belgians, in command of an Allied army, began to move forward, wiping out the Ypres salient in a day and pushing on so rapidly that he lost touch with his transport columns. This was partly due to the appalling conditions of mud that still existed in the neighbourhood. It was literally impossible to get the limbers through except along one narrow and congested route. The French and Belgian troops in the neighbourhood of Oostnieuwkerke and Stadenburg were already suffering privations, when, on October 2, two British squadrons undertook the task of carrying and dumping rations. Altogether, by the evening of the next day, 980 bags of food had been dropped by 80 British and Belgian aeroplanes, at no cost in casualties, and the situation was relieved.

It may truthfully be said that in every sphere of its activity the Royal Air Force redoubled its energies during these last months. In an advance so persistent and so continuous one of the chief duties that fell to pilots and observers was to check the daily position both of the advancing British and the retreating Germans. This necessitated a great deal of low flying, for the weather was largely misty, with fog and rain, but to Army and Corps commanders it was the swiftest and safest method of ascertaining the position of their distant troops.

On a given day, October 30, the R.A.F. undertook 45 reconnaissances and 59 contact and counter-attack patrols; they spotted 19 batteries for destruction or neutralization, and dropped 13 tons of bombs by night and 23½ by day. Their toll of victims for the day was the record number of 68 enemy aeroplanes and one balloon.

From the day the last offensive was launched (November 4) until the day of the Armistice the R.A.F. were persistent in their support of the infantry, although greatly hampered by rain and mist. No great outstanding deeds remain to be chronicled, but there is one story, which has its humorous side, of an airman's adventures that deserves its place in any record of these days.

Captain W S. Philcox, of No. 92 Squadron, was leading a patrol in the neighbourhood of Landrecies when he



Imperial War Museum

GUNS FOR NIGHT RAIDERS

Here is a scene inside the armoury of No. 149 Squadron, which was stationed at St. Omer in 1918 Two gunners, with a sergeant, are inspecting Lewis guns before taking them out of store for use on a night bombing raid over enemy territory. To the left, mechanics are seen overhauling other machine-guns. The trim and decorative appearance of the room suggests a baronial hall rather than a workshop in the war zone



CAPTAIN WEST, V.C.

Magnificent courage was displayed by Captain F. M. F. West (above) when, during an attack on August 10, 1918, he was badly wounded. Though terribly injured in both legs, he engaged six enemy machines and, after driving them off, flew back in a semi-conscious state to make his report. For his heroism he received the V.C.

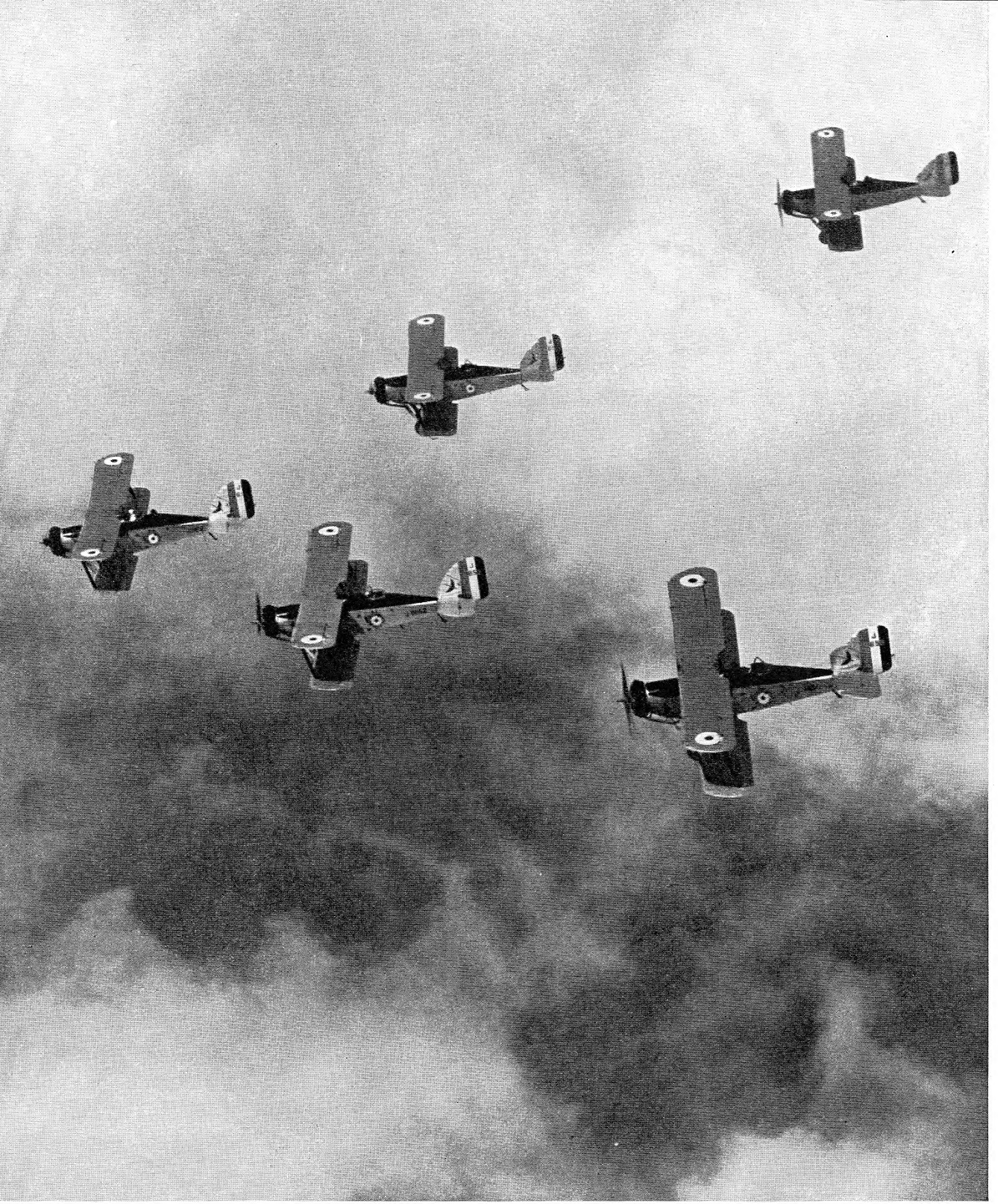
flew into a low-lying mist. He was shot from the ground while attacking a battery and, flying at 120 m.p.h., crashed into some houses. He revived to find himself held by his foot to his machine with a German soldier bandaging his head. Later, he was removed to a casualty clearing station and thence to a French house, which he shared with a badly wounded German soldier. Next morning the Germans informed him that they were leaving, and Captain Philcox was advised to stay quietly until the British army arrived. This they did in the afternoon, finding the gallant airman in peaceful occupation of an upstairs bedroom. His escape had been miraculous, for, apart from shock, his injuries amounted to a bruised face, sprained ankle and broken ankle bone.

A few more bombing raids and reconnaissances, as far as weather would permit, concluded the fighting activities of the Air Force on the Western front. The last year had been one of ever-increasing enterprise and achievement. In Sir Douglas Haig's penultimate dispatch, "The Advance to Victory," he pays tribute to a magnificent record:

During the past year the work of our airmen, in close co-operation with all fighting branches of the Army, has continued to show the same brilliant qualities which have come to be commonly associated with that Service · while the ever-increasing size of the Royal Air Force and the constant improvement in the power and performance of the machines, combined with the unfailing keenness of pilots and observers, have enabled intense activity to be maintained at all times.

Some idea of the magnitude of the operations carried out can be gathered from the fact that from the beginning of January, 1918, to the end of November nearly 5,500 tons of bombs were dropped by us, 2,953 hostile aeroplanes were destroyed, in addition to 1,178 others driven out of control, 241 German observation balloons were shot down in flames, and an area of over 4,000 square miles of country has been photographed, not once but many times.

The tribute is high, but it is not undeserved, and the end of the struggle saw the R.A.F. at the height of efficiency.



L.N.A

'TERRIERS' OF THE AIR

The majority of the Auxiliary Air Force units are designated "bomber" squadrons, but the aircraft are usually of the general-purpose type. Of these the Westland "Wapiti," one of the most successful aeroplanes in this class ever built, has long been standard equipment. Above is No. 601 (County of London) Bomber Squadron, A.A.F., normally stationed at Hendon, flying its "Wapitis" during exercises with the regular Air Force

Aerial Armadas in Being. 11

PLANES-OF-ALL-WORK

By Major Oliver Stewart, M.C., A.F.C.

The general-purpose machine of the R.A.F., of which three types are here described, must be prepared to undertake work of any and every kind, for, as Major Stewart says, there is scarcely a duty in the whole range of air force work which it may not be called upon to carry out

Most widely used of all types of aeroplane in the Royal Air Force is what is known as the general-purpose machine. There are two general-purpose types, a light and a heavy, but the heavy has not come into any great prominence as yet. I shall deal first of all with the light general-purpose aeroplane, therefore, and possibly the best introduction to the varied and interesting work which it is called upon to do will be afforded by a brief outline of a general-purpose aeroplane which is at present in service in the Royal Air Force—the Westland Wallace.

The Westland Wallace is a single-engined biplane of conventional pattern so far as exterior appearance goes, but fitted up in a manner determined by the many different duties it may be called upon to perform. The engine is a Bristol air-cooled radial, and the accommodation provided is for a pilot in the front cockpit just behind the trailing edge of the top plane, and for a gunner immediately behind him. These cockpits in the original type were open, but later the Westland company produced special "conservatories" for both pilot and gunner which enable the cockpits to be completely enclosed. Over the pilot's cockpit a sliding coupé roof is fitted, and the rear end of this merges into the gunner's transparent hood, composed of a number of segments of transparent material. This hood can be completely closed, or kept partly open to enable the gun to be worked.

The pilot's sliding coupé head has windows at both sides, and these can be adjusted for ventilation purposes. For normal entry and exit the coupé head slides forward, but arrangements are made whereby the pilot can make an emergency exit straight through the roof, if at any time he is called upon to use his parachute. As for the characteristics of the Wallace aeroplane itself it will be sufficient to note that it has a 46 ft. 5 in. span and a length of 34 ft. 2 in. Its wing area is 488 sq. ft. and its weight when loaded is 5,750 lb. The military load is 1,130 lb. The maximum range is over 1,100 miles, and the top speed is between 150 and 160 m.p.h. All-metal construction is used, and provision is made for the aeroplane to be fitted with a float undercarriage and so turned into a floatplane. Wing slots are fitted so as to give the maximum of stability at and near the stall.

Now let me enumerate some of the duties which this machine must be ready to perform. It must first be capable of doing day bombing raids. Then it must be capable of being used for photographic patrol and for general reconnaissance. It must be so arranged that it can be used for the transport of stores, of fuel and oil, of victuals and of spare parts. It must be equipped with a forward fixed gun firing in the line of flight and with a movable rear gun, and it must be capable of doing artillery observation and message-dropping in the same way as an Army co-operation machine. In fact, there is scarcely a duty in the whole range of air force work which the general-purpose aeroplane can be sure of never being called upon to do.

Let me now turn to the arrangements made in the Wallace to allow it to tackle these numerous and varied duties with reasonable efficiency. For the bombing, suitable racks are fitted, enabling the machine to carry, under normal conditions, 580 lb. of bombs and, under overload conditions, 1,000 lb. of bombs. There is a prone bombing position, which is used by the gunner and which

A LIFE OF UBIQUITY

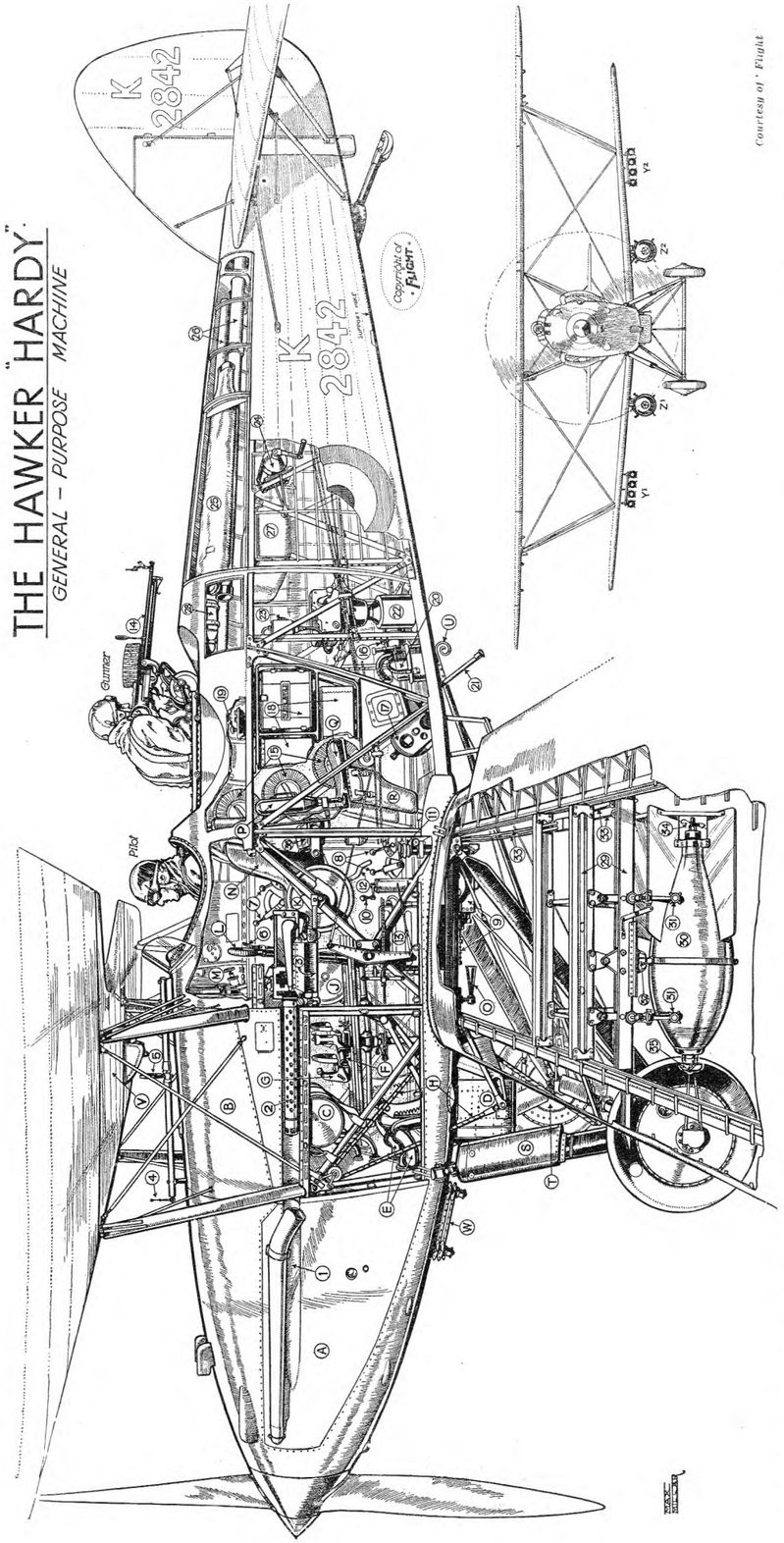
The Hawker "Hardy," of which we also reproduce a detailed drawing in the next page, is one of many variations of the "Hart" light bomber. It can carry all the equipment necessary in a general-purpose machine. In this photograph, note, between the undercarriage legs, the message hook, also a feature of army co-operation types

Courtesy of 'Flight'



THE HAWKER "HARDY"

GENERAL – PURPOSE MACHINE



Courtesy of 'Flight'

KEY TO MILITARY EQUIPMENT

1. Gun trough in engine cowl
2. Vickers gun (ammunition box not shown)
3. Spent cartridge chute
4. Bead sight for Vickers gun
5. Ring sight for Vickers gun
6. Firing trigger for Vickers gun on pilot's control-column
7. Pilot's bomb-release levers
8. Prone bomber's bomb-release levers
9. Prone bomber's bomb-sight
10. Adjustable mounting for bomb-sight
11. Tail drift sight
12. Lever con rolling fuses in bombs
13. General-purpose accumulator charged by engine-driven generator
14. Lewis gun on universal mounting
15. Lewis gun ammunition drums
16. Motor generator for wireless H.T.
17. Winch for wireless aerial
18. Complete self-contained wireless transmitter and receiver
19. Target signalling lamp for wireless
20. Aldis signalling lamp
21. Lead-in for wireless aerial
22. Camera
23. Motor-drive for camera
24. Emergency hand-driven generator
25. Frame aerial in bag
26. Aerial mast (30 ft.—stowed in sections)
27. Base for frame aerial
28. Emergency rations
29. Universal bomb-carrier
30. Bomb (250 lb.)
31. Adjustable bomb steadies
32. Bomb release hook
33. Bomb release and fusing cable (in ducts)
34. Propeller fan
35. Note-case
36. Stowage for gunner's detachable parachute

KEY TO AEROPLANE EQUIPMENT

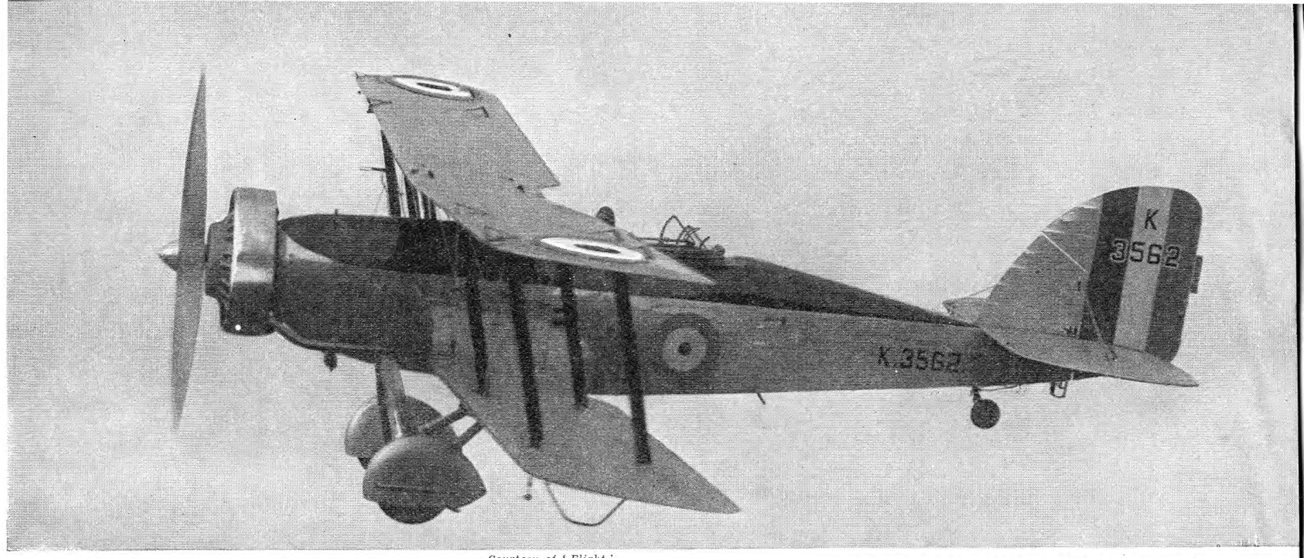
A. Rolls-Royce "Kestrel" engine—525 h.p.
B. Main petrol-tank
C. Oil-tank
D. Retractable radiator
E. Articulated water-pipes to radiator
F. Rudder-bar
G. Brake-pedal for hydraulic wheel-brakes
H. Rubber suspension for counterbalance of radiator weight
J. Wheel for raising or lowering radiator
K. Tail-trimming wheel
L. Control-column
M. Pilot's instruments
N. Pilot's seat
O. Venturi for turn-indicator
P. Fire-extinguisher (for engine and elsewhere)
Q. Folding seat for gunner
R. Bag for starting-handles
S. Oleo undercarriage leg
T. Hydraulic wheel-brake
U. Message pick-up hook
V. Wing petrol-tank
W. Engine oil-cooler

LOADING OF BOMB RACKS

At Y1 and Y2 light bombs may be carried, or, alternatively, desert rations, fuel, and certain equipment.

At Z1 and Z2 the bomb-load may consist alternatively of a number of 20-lb., 112-lb., or 250-lb. bombs.

MILITARY AND MACHINE EQUIPMENT OF A STANDARD GENERAL-PURPOSE TYPE



Courtesy of 'Flight'

LEADING ALL-PURPOSE TYPE

After the "Wapiti" (see page 778), the Westland Aircraft Works produced a development known as the "Wallace" (above), which has also been ordered for the R.A.F. Improvements include a 570 h.p. Bristol "Pegasus" engine with a special ring cowling, wheels enclosed in streamlined "spats," and a tail-wheel to facilitate manoeuvring on the ground. The "Wallace" was used on the Houston Mt. Everest Expedition in 1933

is situated under his ordinary cockpit in the floor of the fuselage. For photography, the camera is arranged in the bay of the fuselage immediately behind the gunner's cockpit. Wireless apparatus is also arranged behind the gunner's cockpit, being mounted within the top fuselage fairing. For use at high altitudes, oxygen equipment for both pilot and gunner is carried.

In addition to these fittings, comprehensive provision is made for the carriage of spares and tools. An extra fuel tank may be fitted and a spare wheel. Space is set aside for emergency rations, engine spares, water, bedding and personal equipment. The amount of equipment carried for desert service is extremely large, and great ingenuity is called for from the designer in order that it shall all be stowed conveniently in the relatively small fuselage.

In the heavy type of general-purpose machine even more comprehensive equipment is carried, and tackle and special doors are provided so that entire spare engines can be carried. The machine can even be turned into a miniature flying hospital. The heavy general-purpose machine shows signs of merging with the bomber-transport, which is really a development of it, and which is also capable of performing a variety of different duties. It can, for instance, do heavy bombing raids at night, and can be converted at a moment's notice into a troop carrier capable of transporting soldiers, together with their arms and equipment and their rations.

Before I pass to the actual general-purpose work done by the Royal Air Force I must mention two other general-purpose machines which help to illustrate the kind of thing that is approved for service use in this class. One is the Vickers Vincent and the other the Hawker Hardy. Both are single-engined biplanes of more or less conventional pattern; but the Vincent has an air-cooled engine, while the Hardy has a water-cooled Rolls-Royce engine. The Vincent is a three-seater and is a development of the well-known Vildebeest torpedo-bomber. In addition to all the gear enumerated for the Wallace, the Vincent carries demountable wireless masts to enable the wireless transmitter to be worked from the ground.

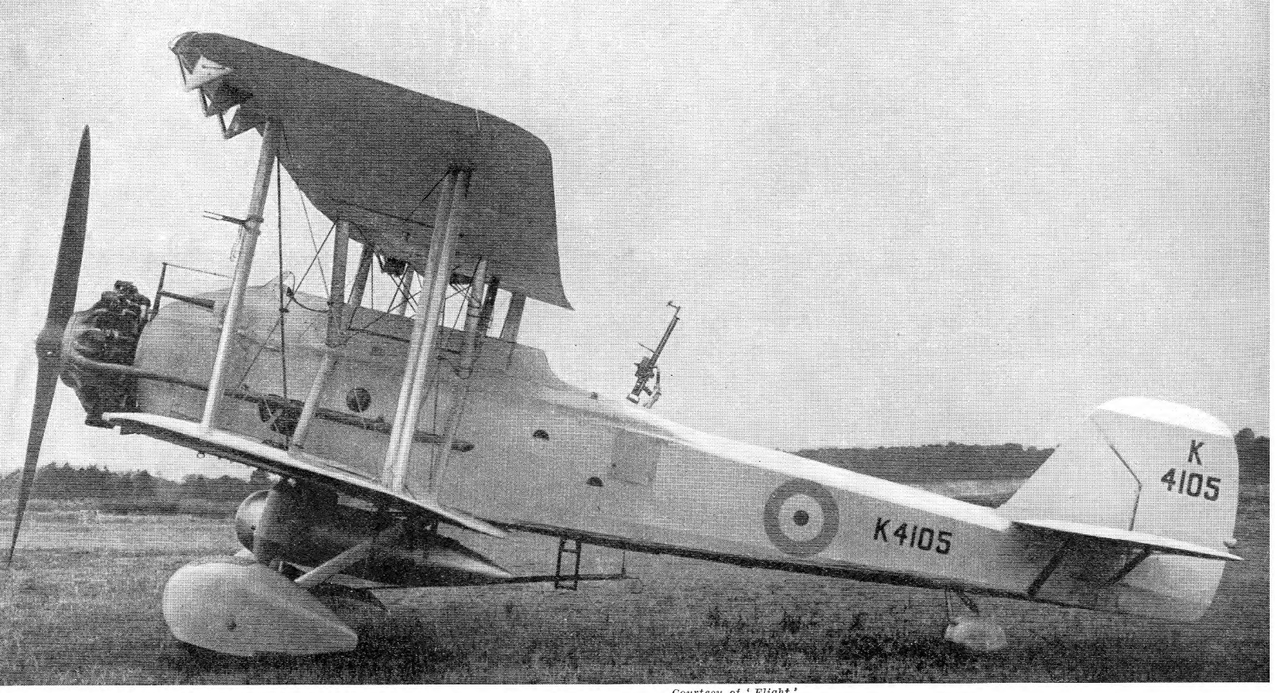
The Hardy is really a variation of the Hart and is almost indistinguishable from it in external appearance. But, again, the interior of the machine has been carefully planned to enable all the gear which the Air Staff regards as necessary to the general-purpose aeroplane to be stowed. Desert equipment—a comprehensive term which includes a large number of different things—is one of the biggest items in the equipment of the general-purpose machine.

A large proportion of the Royal Air Force overseas is equipped with general-purpose aeroplanes. The evacuation of Kabul, one of the most remarkable achievements of the R.A.F. in peacetime, during which a total of 586 people were evacuated by air between December 23, 1928, and February 25, 1929, was done mainly with heavy general-purpose aeroplanes or troop carriers, although Westland Wapiti aircraft, which may be said to have been the forerunners of the present Wallace aircraft, also did some of the work.

Co-operation with ground troops is one of the important classes of work for which the general-purpose machine is sometimes in demand. The revictualling of columns of troops is one form of this co-operation. In addition, the maintenance of isolated posts has been done entirely by aircraft of the R.A.F., an example having been provided in southern Iraq some years ago. Two outposts of aircraft and armoured cars were so situated that it would have been impossible to maintain them both by ground transport. The surrounding ground was largely swamp or sand. Consequently, at Ur, a supply column was formed which included nine aircraft. During five months these aircraft carried to the detached posts over 517 tons of fuel, drinking water, food, spares, and all kinds of rations and articles of equipment.

Special parachutes have been devised which can be used for dropping supplies for ground troops when these are posted at places where it is not possible for the aircraft to land. A column of troops has been rationed by means of these parachutes with complete success, and there is plenty of evidence that military commanders have recognized that the general-purpose aircraft can, in effect, maintain troops which have been completely cut off from ground supplies for unlimited periods.

An instance of the way in which the general-purpose aeroplane may co-operate with ground troops was provided when 1,400 men and 850 animals, moving up from Dargai, which is north of Peshawar, were kept in food supplies entirely by aircraft during the first two days of their march. Three tons



Courtesy of 'Flight'

GUARDIAN OF THE DESERT

The "desert equipment" of an R.A.F. G.P. (general-purpose) aeroplane includes an extra fuel-tank, which, in the case of that fitted to the undercarriage of the Vickers "Vincent" 3-seater (above), doubles the normal flying range (625 miles). The "Vincent," similar to the "Vildebeest" torpedo bomber, was designed for tropical service in the Middle East

of supplies of rations and forage were dropped daily by fourteen Westland Wapiti aircraft. The machines used the special supply-dropping parachute device, each machine carrying several parachute loads weighing up to 56 lb. and making four journeys daily.

It may be mentioned that the squadrons which are equipped with general-purpose aeroplanes are designated bomber squadrons in the official references. They include both regular and auxiliary Air Force squadrons and they are stationed mostly in India, but there are a few squadrons in the Middle East, Iraq and England.

In recent months the high value of the general-purpose aeroplane has led the air staff to consider a number of new types. Among these some extraordinarily interesting machines, capable of doing even more varied tasks than the ones in present use, were produced by leading manufacturers. The Vickers Wellesley was produced as a general-purpose aeroplane, but its remarkably high performance has led to the question being raised as to whether it ought not to be redesignated as a day bomber. It is the first aeroplane of geodetic construction to be put into production for the Royal Air Force, and its range is greater by a large margin than that of any other general-purpose type. The geodetic construction is a special form of light-weight construction invented by Mr. B. N. Wallis, who was chief designer of the airship R100. It enables spars, ribs, formers, bracing wires and all the other internal paraphernalia of the conventional aeroplane wing to be done away with, and the hollow wing shape to be made up of members which actually take the load. It also allows the use of a very high aspect ratio—that is, a long, narrow wing. (*See* pages 716 and 763.)

Another interesting type of general-purpose machine recently produced is the Handley Page monoplane. This is a fully-slotted and flapped aeroplane with a wide speed range, which can not only do all the tasks already enumerated as being essential for the general-purpose machine, but, in addition, it can act as a small troop carrier, taking about half a dozen people, or as an ambulance machine to take one stretcher case.

In many classes of service aircraft there has been lately an increasing tendency towards specialization. In the interceptor fighter a high degree of specialization has been adopted in order that the maximum performance may be secured. It seems probable that the day bomber will also tend towards greater and greater specialization as speeds and ranges increase. The result is likely to be that a greater and greater responsibility will devolve upon the general-purpose machine, for it exists to do all the tasks which the other machines, owing to their specialized form, cannot do.

The day is probably still far distant when the Royal Air Force will provide its own transport service and will carry its supplies in its own aeroplanes. But it seems positive that that day will come eventually, and, as it approaches, so greater and greater use will be made of the general-purpose aeroplane. Fuel is taken to outpost aerodromes by air; rations are carried for the men; spare engines are moved about by air; sick men are brought back to hospital by air; the staff use aeroplanes as flying offices or on tours of inspection.

One of the machines which King Edward VIII employed for taking him about the country to fulfil his engagements was a Westland Wapiti general-purpose machine, and this type does usually offer suitable accommodation for those who would use it as a high-speed staff aeroplane to do the kind of work which the staff cars have always done on the ground. On the whole, therefore, I expect to see the general-purpose type of aeroplane in increased demand as the other types become more and more specialized. And I expect, in particular, to see the large size, twin-engined general-purpose aeroplane, capable of doing anything from heavy bombing to troop carrying, coming to the fore and being ordered in much greater numbers than hitherto.

Art and Craft of Airmanship. 11

FIGHTING FIRE AND PEST FROM THE AIR

By Major Oliver Stewart, M.C., A.F.C.

The uses of the aeroplane are, fortunately for mankind, not confined to fighting and bombing or even to carrying passengers and mails. For the past decade or so the aeroplane has been rendering invaluable services to mankind in destroying insect pests and fighting fire, activities in which its speed is invaluable

THE aeroplane is regarded mainly as a weapon of war and a commercial transport machine, but it performs many other duties, some of them of unusual interest. One direction in which the aeroplane has proved to be of exceptionally high value is that of fire-fighting in the world's great forest areas. Another is that of crop-dusting with insect-destroying powders.

Fire-fighting from the air is one of the most dramatic of all aerial activities outside actual warfare. Forest fires annually cause the destruction of hundreds of thousands of pounds' worth of property, and they have always presented a problem of the first magnitude to those who attempt to quell them. They move with such rapidity that huge areas are destroyed before anything can be done, and under the best conditions the most that can be hoped for is to check the fire by clearing away belts of ground in its passage and so starving it of fuel.

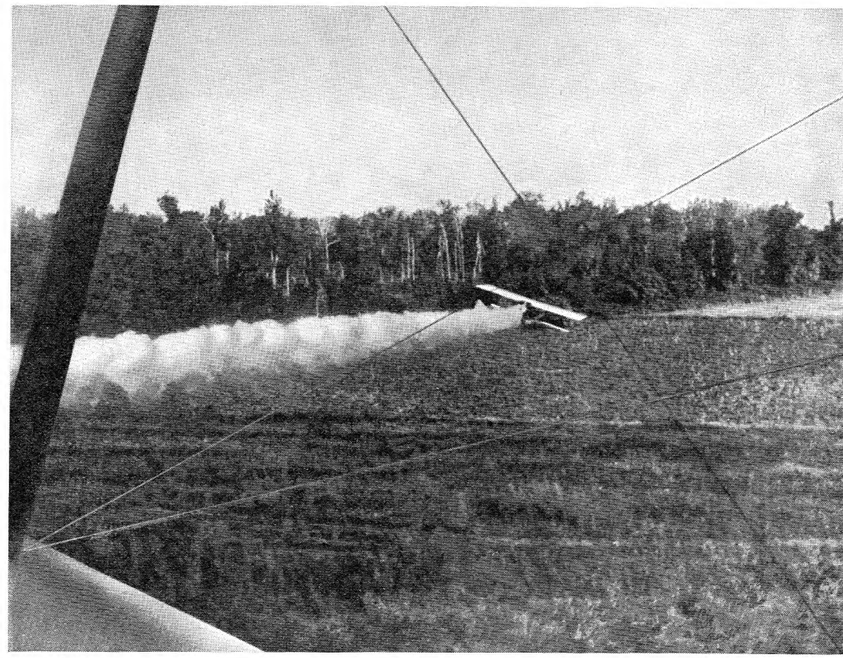
In Canada forest fire has always been one of the most dreaded visitations, and the Government has taken every possible step to deal with it and to reduce its magnitude. But nothing was found to be of much use until the coming of the aeroplane. Then a different complexion was put upon the entire problem. As in fires in cities, the thing which is of the first importance in dealing with a forest fire is speed. The fire-fighters must be warned early and brought to the scene with the smallest possible delay.

When there are vast tracts of forest land such as are to be found in northern Manitoba, the difficulties of maintaining any sort of effective watch by any known means from the ground can be appreciated. But from the air watch can be kept with much greater ease and certainty. The aeroplane provides a ready-made and movable watch-tower from which enormous areas of ground can be examined at leisure. And when there is reason to suppose that an outbreak has occurred in some part, the aeroplane can be quickly on the spot to make a closer inspection.

Then, if the closer inspection reveals that a fire has actually started, the aeroplane can be used for rushing fire-fighters to the spot. Afterwards, according to the technique that has been evolved in Canada, the aeroplane can be used to keep the fire-fighters supplied with food and other necessaries while they attempt to check the spread of the flames. So successful has this aerial method of fighting forest fires proved that it has been widely adopted in Canada and quite large numbers of aeroplanes and pilots are employed upon it.

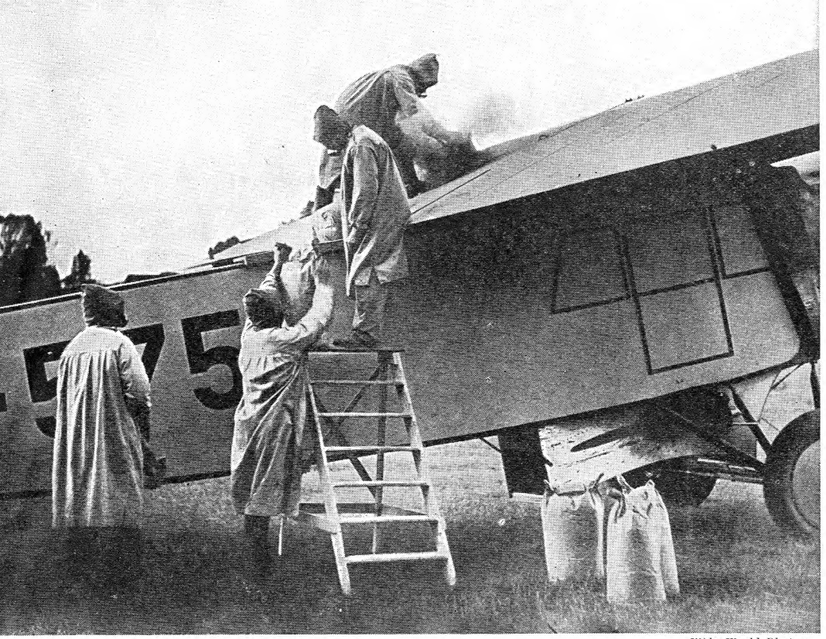
The adventures of some of the aerial fire-fighters are extremely exciting, for they fly over enormous tracts of uninhabited country where forced landings are apt to be extremely dangerous. In order to enable them to send news of their whereabouts if they are forced to land they have with them carrier-pigeons. On one occasion a pilot who was on fire patrol duty omitted to take his carrier-pigeons with him. He suffered engine failure and came down somewhere near the shores of Lake Winnipeg. It was not until the iron rations carried in the machine were exhausted, and the pilot had almost given up hope of being found, that he was finally discovered by the crew of a fishing boat. Both landplanes and flying boats are used for fire patrol.

Fire-fighting is a truly conservative activity, and so it indicates that the aeroplane is by no means only a destroyer. The same thing may be said of crop-dusting. It was first introduced to the



DUSTING THE COTTON

This aeroplane is pouring out a fairly heavy supply of insecticide only some 50 feet above a cotton-field in process of being "dusted." Note the spiral effect of the dust cloud, caused by the slipstream of the propeller. Dusting from the air has been found most efficacious in the opinion of leading agriculturists



Wide World Photos

POISON—AGAINST PESTS

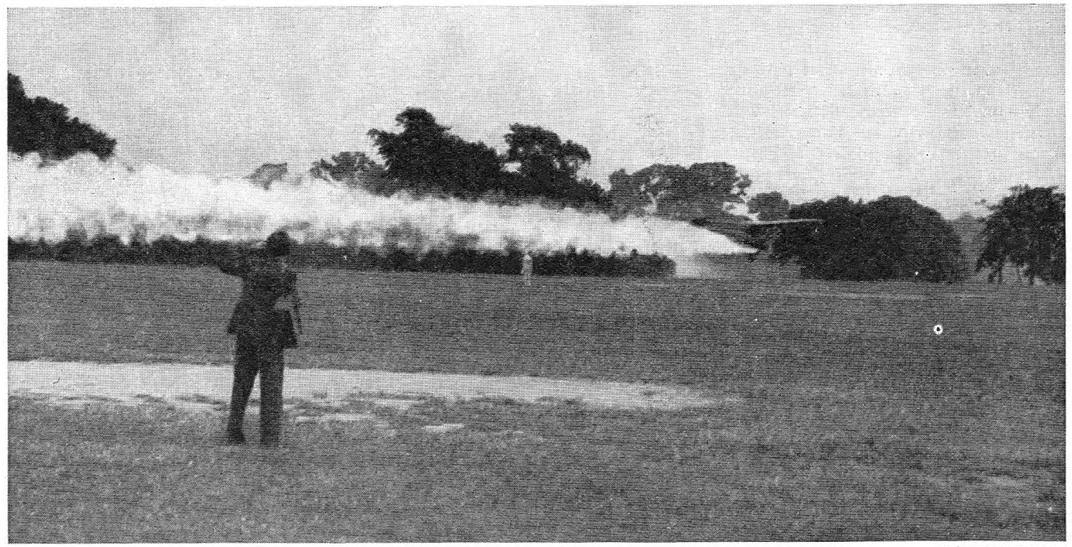
During 1934 a forest near Wittstock, in Prussia, was invaded by a plague of destructive caterpillars, and it was decided that the only effective means of dispelling the pests was by aeroplane. A special poisonous dust, named "verindal," was therefore released over the forest The crew of the aircraft had to wear protective clothing against the poison

public attention by the State Experimental Station of Ohio, which did a test in August, 1921. Lead arsenate was sprayed from an aeroplane over a grove of catalpa trees in order to poison the insects which infested the grove and were destroying the trees. The experiment was successful, and led many people who deal with crops on a large scale to turn their attention to the possibilities offered by the aeroplane for dusting purposes.

In this experiment a box of sheet metal was used with a lid through which the dust was filled. Inside the box there was a sort of paddle-wheel, which forced the dust down the outlet tube that extended below the fuselage of the aeroplane. The paddle-wheel was rotated by hand through suitable gearing. During the first experiments it was found that the air eddies around the outlet pipe caused some of the dust to be thrown back upon the aeroplane. A slit was, therefore, cut in the side of the pipe and other slight modifications made to its shape, so that the dust should be drawn out in a uniform stream.

Probably the greatest use has been made of the insecticide-laying aeroplane for dusting cotton fields. In doing this work the pilot comes down towards the field in a glide with engine partly on, and then passes across the field at a height of less than 100 feet, and sometimes less than 50 feet, with the dust-distributing mechanism in action. At first an air speed of between 75 and 90 m.p.h. was used for this dusting. But it was found that the dust was unevenly distributed, so a new type of machine was evolved in which the dust was sucked out by the speed of the aeroplane. As the suction varied with the aeroplane's speed, this method gave an even layer of dust regardless of the aeroplane's speed. It still suffered some disadvantages, however, and, finally, an air-driven paddle type of dust-distributor was evolved which proved satisfactory.

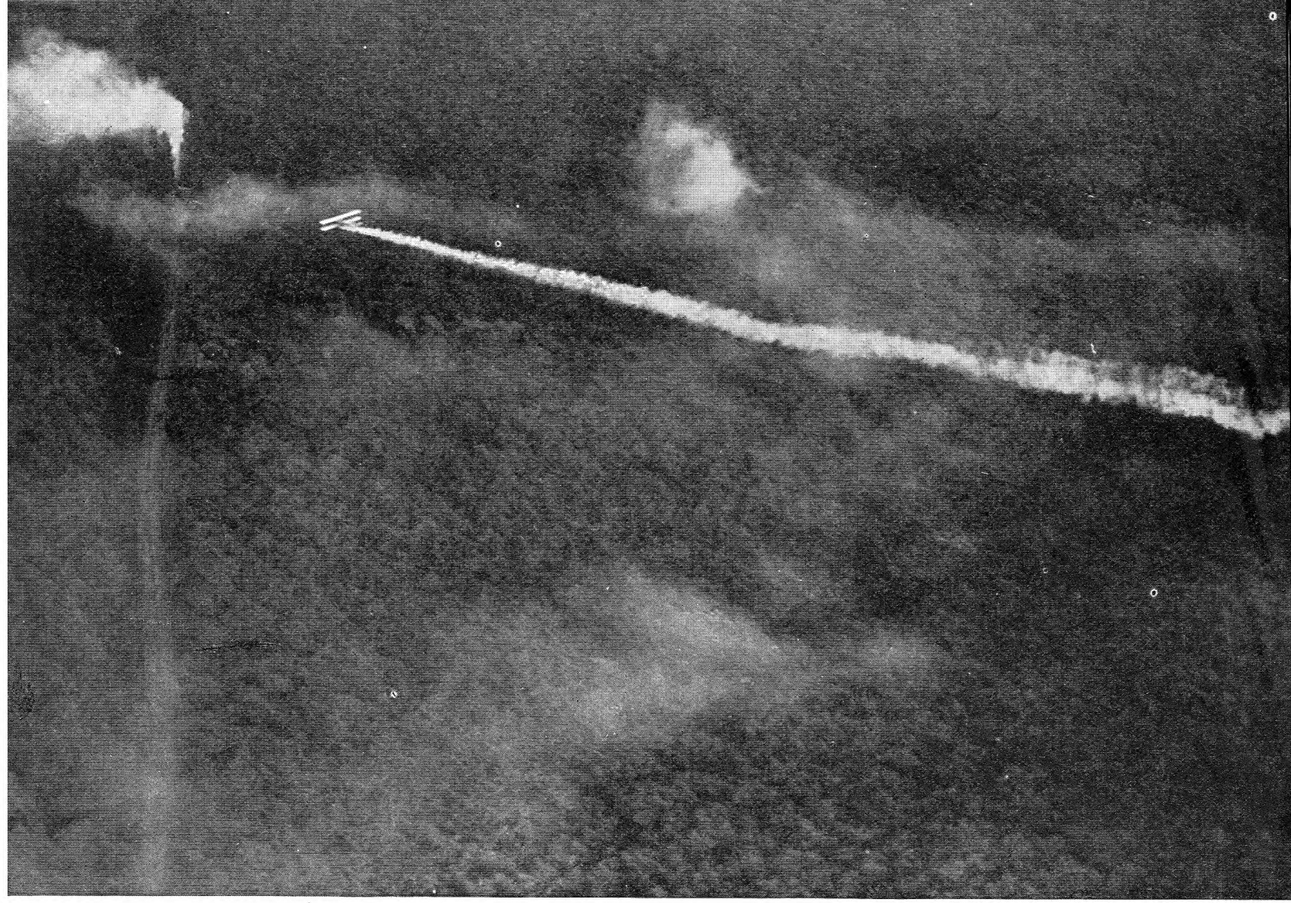
An indication of the rapidity with which aerial dusting was taken up in the United States of America is given by the fact that in 1926 100,000 acres of cotton fields were dusted, which is some fourteen times the area dusted in 1923. The advantages over ground dusting are numerous. According to Mr. Dudley Wright, who has a wide experience of this work, the aeroplane saves from 50 to 60 per cent of the calcium arsenate required to produce the same results by any other method of dusting. According to the same authority, one aeroplane will carry out the work of from 50 to 75 cart dusting machines, as the best cart machine under favourable conditions dusts about 30 acres *in a day* compared with the 200 to 1,000 acres *per hour* done by a single aeroplane.



Wide World Photos

BEAUTY PRESERVATION BY AEROPLANE

This plane is not, as might be imagined, laying a smoke-screen, but is engaged in the equally practical and more beneficial task of spraying trees with a chemical preparation. These trees, in Fairmount Park (Philadelphia), are very valuable, and the spray was intended to protect them against both insects and decay. Early morning and evening are the best times for carrying out the work, when the wind strength is relatively small. Spraying from the air is a cheaper and quicker method than those hitherto employed



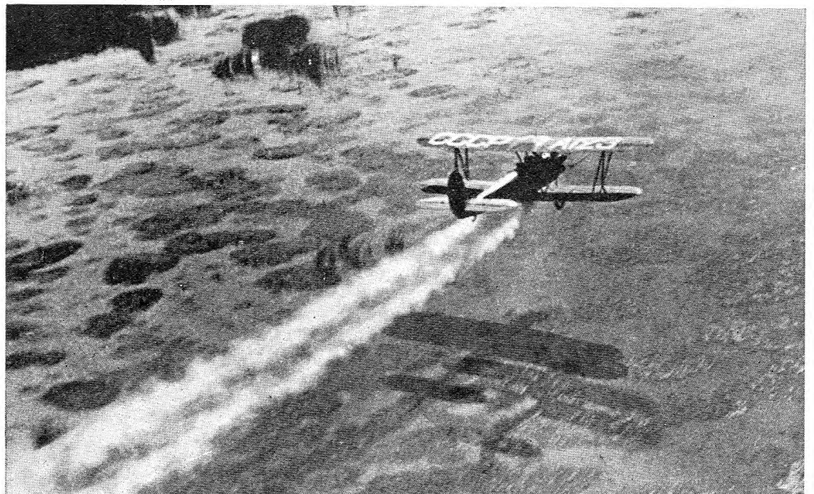
PURGING THE PINE-FOREST

This photograph was taken in 1926, by which year the value of the aeroplane as a fighter of pests was fully recognized, though as yet limited in application. The Forestry Dept. of Alsace-Lorraine engaged aircraft to lay a cloud of arsenate of lime 6,000 sq. yds. in extent over the Haguenau pine-forests, to rid them of the destructive Fidonia caterpillar

PAINLESS EXTERMINATION

Those who regard the aeroplane merely as a menace to civilization would do well to study this photograph. It shows a Russian machine aiding in the extermination of an enemy of all mankind—the malaria pest—on the banks of the Caspian Sea

Planet News



In addition to dusting crops and trees, the aeroplane has been applied in Germany for forest pest control. In the German method aeroplanes flying at between 12 and 60 feet above the tree-tops are used, dusting strips varying from 80 to 120 yards wide. According to Mr. Dudley Wright, an experiment done in Germany in 1925 succeeded in killing all the nun moth larvae in five to six days without injurious effects upon birds or game.

For controlling locusts in North and South Africa the aeroplane has also been advocated as the best possible instrument. Mosquitoes, also, have been attacked by Royal Air Force aeroplanes



Imperial Airways

ABOVE THE PLAGUE AREA

The Biblical plague of locusts is recalled by this extraordinary photograph of a locust swarm over the Sudd Swamps, in the lower reaches of the Nile. This region is on the regular Imperial Airways Empire route through Africa, and Malakal aerodrome is quite near. From the air, a locust swarm resembles a huge, shapeless, fast-moving curtain, extraordinary as a spectacle, but devastating in its destructive effect

in some parts of the British Empire. Crop-dusting by aeroplane has even been used in Britain, although obviously, there, the relatively small size of the crop areas militates against the fullest advantage being taken of air control. But fruit trees and potatoes have been dusted as a protection against caterpillars in England.

If one attempts to look into the future, one is struck by the fact that, wherever there are large areas to be watched or tended in any way, there the aeroplane will become a necessity. Whether the area be a forest or tract of cotton fields or other crops, the aeroplane can not only provide a means of inspecting it quickly and thoroughly, but it can also provide a way of protecting it against the terrible ravages of fire and pest. It is of interest, too, to note that it has happened that the aeroplane has been used for fire-fighting purposes in big cities when there has been an outbreak of more than ordinary intensity, which it has proved difficult to overcome. There the aeroplane can sometimes provide a point of view for the officer in command of the fire-fighters which will enable him to lay his plans with a better chance of success. If necessary, he can communicate by wireless with the fire-fighters on the ground.

He can reconnoitre over the area threatened by the conflagration and observe, in a way that would be impossible from the ground, the disposition of buildings and estimate the probable path of the fire and then station his men accordingly. It is quite possible, too, that the aeroplane might be used for actually fighting an outbreak by dropping non-inflammable liquids and gases in containers on to the affected buildings.

There can be little doubt that the value of the aeroplane in these two fields—fire-fighting and fighting pests—has even yet not been fully recognized, and that in the future even wider use will be made of it. It may be that the ravages for which locusts have been responsible in the past, when tremendous losses have been suffered by farmers, will eventually be entirely suppressed with the aid of the aeroplane.

Thus it will be seen that the aeroplane can be turned to conservative uses and that then it can often furnish results fully as dramatic as it has furnished in war. It can tackle pests which have, through the centuries, defeated the efforts of Man, and save valuable crops and forests as a result of its speed and of the way in which it enables observation to be made over wide areas in a short space of time.

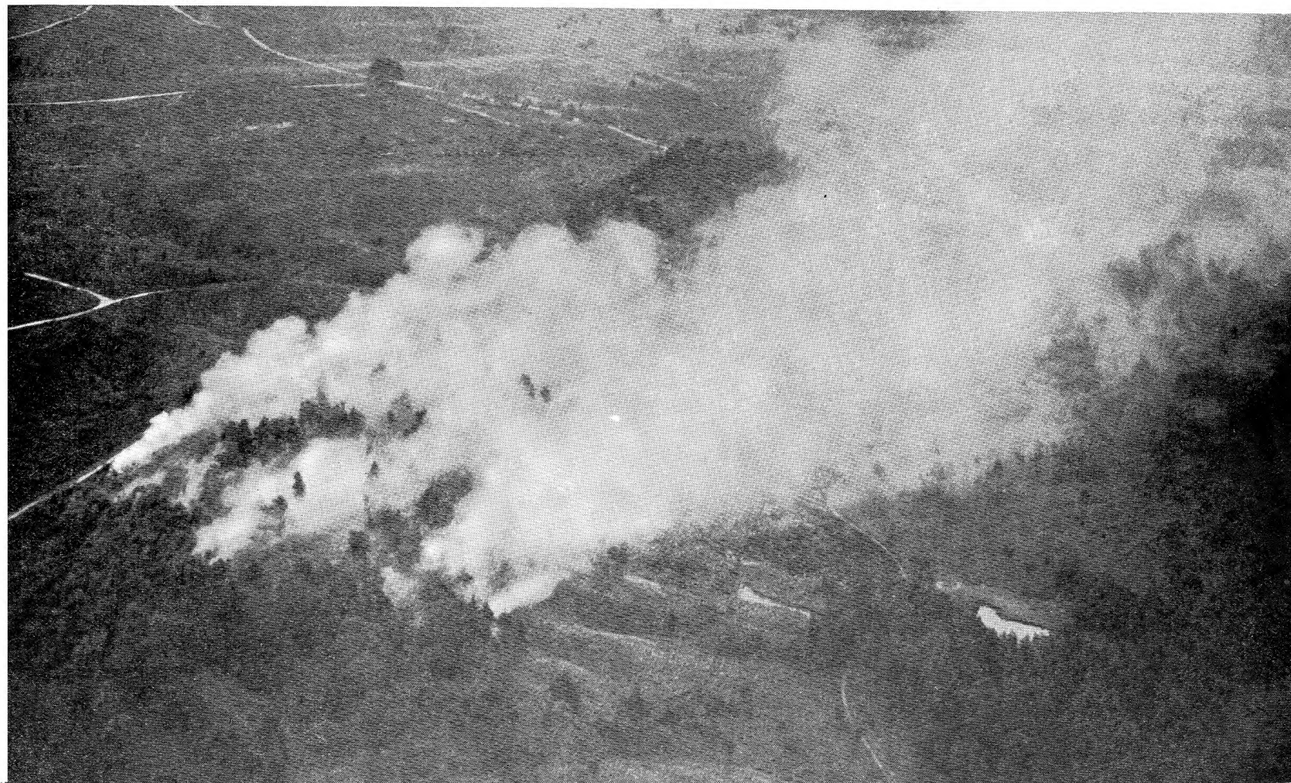


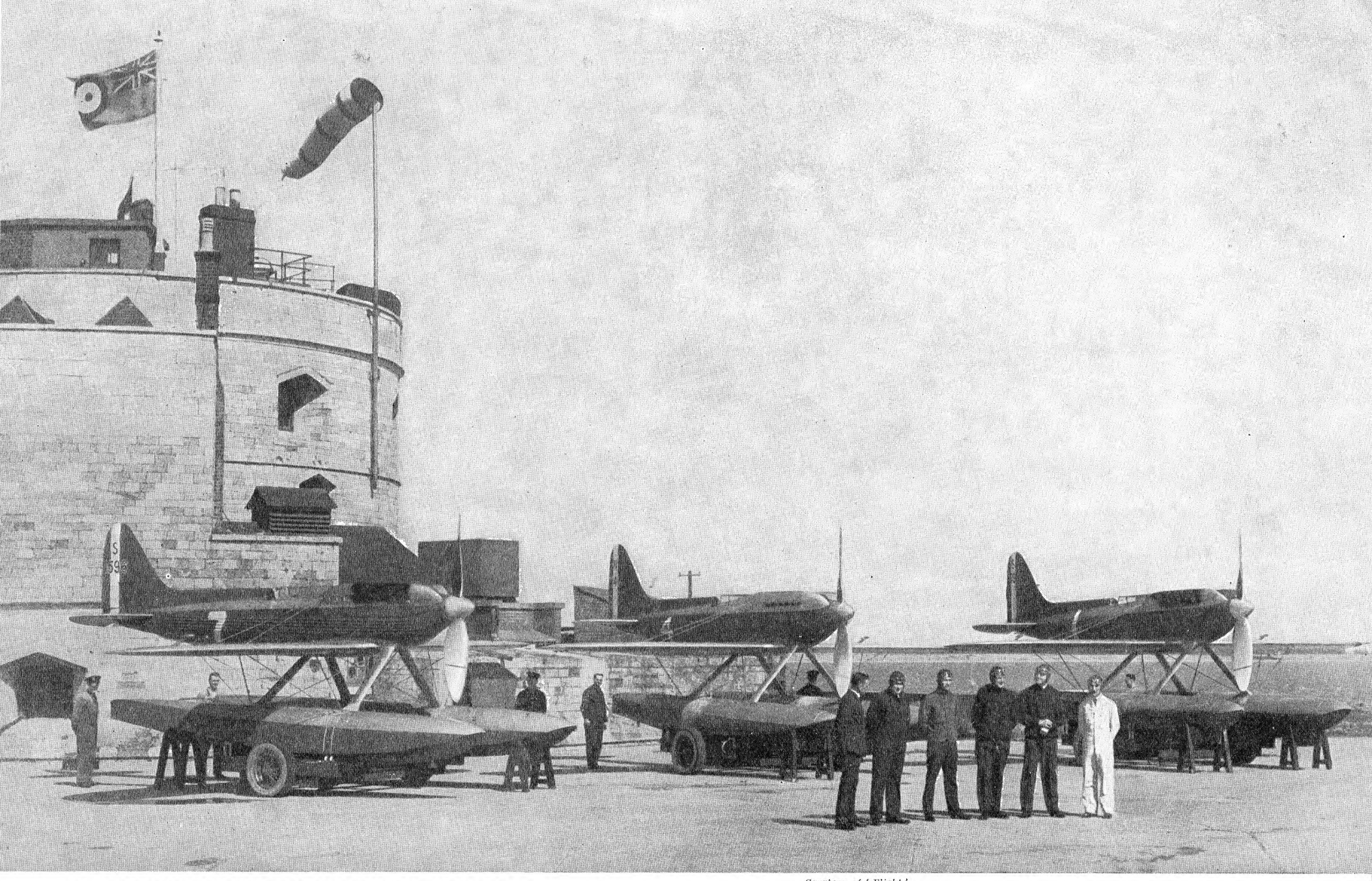
Wide World Photos

FIGHTING FIRE FROM THE AIR

A true idea of the extent and track of a fire can only be obtained from the air. The Autogiro, in particular, with its remarkable hovering powers, is ideally suited to fire patrol. The photograph above was taken during a great fire in S. Jersey, U.S.A., and shows an Autogiro carrying the State Fire Warden, who directed the ground operations by wireless. Below, an air view of a widespread heath-fire near Aldershot

Charles E. Brown





Courtesy of 'Flight'

CLIMAX OF BRITAIN'S HIGH-SPEED PROGRESS

For the last Schneider Trophy race in Sept., 1931, in which British participation was only made possible by the generosity of Lady Houston, an R.A.F. high-speed Flight, commanded by Sqn. Ldr. A. H. Orlebar, was based at Felixstowe, and later at Calshot, Hants, where this photograph of the Flight and their seaplanes was taken. It shows the 1929 Supermarine S-6A type between the two S-6B machines specially built for the 1931 race. That on the right was used by Flt. Lt. J. N. Boothman when flying over the course to win the Trophy outright, and that in the foreground was afterwards Flt. Lt. G. H. Stainforth's "mount" when breaking the world's speed record

MIRACLES OF SPEED AND ENDURANCE

By Grenville G. O. Manton

In an age of speed the aeroplane stands pre-eminent with its dazzling pace that outstrips that of any other form of travel. Here, in this chapter, the story is told of those achievements made in recent years with high-speed and long-range aircraft which have established records and set new standards in aviation

In tracing the development of aviation it is not necessary to go back very far in history, for little more than three decades ago mechanical flight had not been achieved. The aeroplane—even the very word—did not exist, and men who spoke of flying and schemed to fly were ridiculed by a sceptical world.

But many of those who scoffed and some of those who strove are living today to see and to marvel at the manner in which the aeroplane, once so frail and feeble and uncertain, goes resolutely forward to conquer space and time. The various periods in the history of aviation—the pre-War years, the War-time and post-War eras—have been eventful ones full of triumphant progress, but the achievements made in the last decade are the most wonderful of all. Machines that fly at more than six miles a minute, machines that fly by day and night without a halt or in tremendous "hops" of thousands of miles—such are the products of the modern age.

In this astonishing development of high-speed flight the Schneider Trophy contest has exerted a marked influence, for those countries that competed, notably Great Britain and Italy, put forth supreme efforts to build winning machines. The race that was first won in 1913 at a modest 45¾ m.p.h. became, in the course of but a few years, an event in which speeds of under 300 m.p.h. were useless to achieve success. So the sleek, small-span seaplane with an abnormally powerful engine took shape.

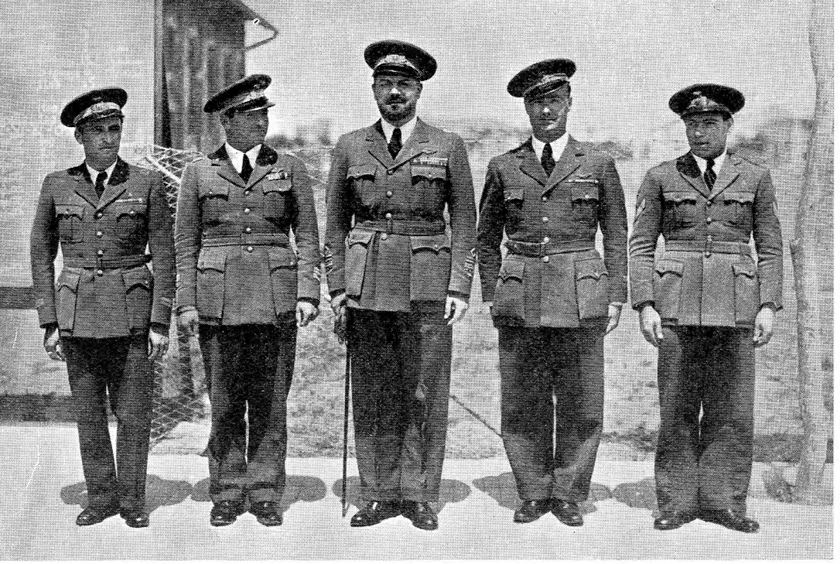
The last three races, held in 1927, 1929 and 1931, found Britain completely triumphant, with the famous trophy in the end remaining permanently in her possession.

Venice was the venue of the 1927 contest, and it was there that the British-built Supermarine S5 machine showed its tremendous pace. Every means for increasing the seaplane's speed was incorporated in its design. With a wing-span of only 26 ft. 9 ins., and an overall length of 24 feet, it was, nevertheless, powered with a Napier "Lion" engine that yielded 900 h.p. The cross-sectional area of the fuselage was cut down to the lowest possible limits, so much so that there was no room for fuel tanks, which were ingeniously housed in one of the floats. To reduce head resistance still further, the radiators for cooling the engine

BALBO'S AIR ARMADA

One of the most ambitious formation flights ever carried out was done by 100 Italian airmen who flew, under the command of General Balbo, in 24 Savoia-Marchetti S.55x flying boats across the North Atlantic in 1933. Leaving Ortobello on July 1, they went via Iceland to Chicago, U.S.A., arriving there on July 15. They made a return flight by way of the Azores to Lisbon in the following month. Here are seen 11 of the flying boats





COMMANDER AND HIS CREW

General Italo Balbo, who commanded the massed flights from Italy to America and back in 1933, became a national hero as a result of these and other exploits in the air. He is seen here (central figure) with his companions who flew with him in the Savoia-Marchetti with which he headed the formation during the double ocean crossing

were placed in the wings, with their cooling surfaces forming part of their contour, and a special oil-cooling radiator, made in the form of tubes, was located so as to be almost flush with the fuselage sides. From propeller boss to rudder every detail was smoothed and streamlined. The S5 was the sleekest, slimmest thing that had ever flown and was unquestionably the finest example of high-speed aircraft of that time. When Flight Lieutenant S. N. Webster streaked round the course to win the race at 281·669 m.p.h., it seemed, indeed, that the limit in mechanical speed had been reached.

How far from the truth was such a conclusion was proved, however, when the tenth and penultimate Schneider race was flown in the summer of 1929. In the intervening period between the Venice contest and the 1929 event the Supermarine Company, working in co-operation with the Rolls-Royce concern, had produced a new machine, the S6. This craft was similar in general design to the S5, but was fitted with a more powerful engine, an " R " type Rolls-Royce of 1,950 h.p. Two S6's were entered for the race, with the S5 as a third machine, and the Italians, who were the only challengers, were equipped with three Macchi monoplanes. These, too, were machines of wonderful power and performance, but it transpired on the day of the race that they were no match for the British planes.

The thousands who went to the Solent in September, 1929, to see the classic contest witnessed one of the greatest air spectacles in history. In the brilliant sunshine and blue sky the glistening silver British planes and the blood-red Macchis streaked round the triangular course of 31 miles at speeds that left onlookers aghast. The thunderous roar of the engines, running at full throttle, seemed to reverberate round the skies, to fill the heavens. The machines flew so fast that they " raced their own noise." Even at a distance, when they appeared as mere specks, their colossal speed was obvious. It was a sight that strangely stirred the emotions, and one marvelled that man could construct and control such craft as those winged projectiles.

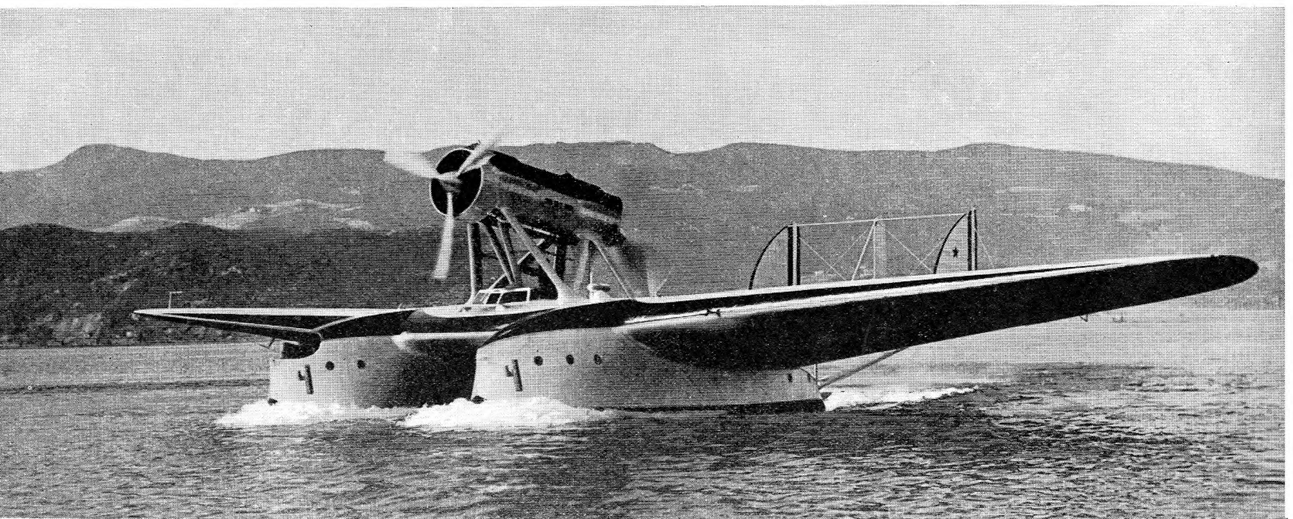
In something over half an hour the race was won, the winner, Flying Officer Waghorn, in his S6, having covered the 217·49 miles at an average speed of 328·63 m.p.h. Two years passed and once more, and for the last time, the race for the Schneider Trophy was flown. It was, in fact, a " fly-over " for Britain, for on this occasion there were no challengers.

On Sunday, September 13, 1931, Flight Lieutenant J. N. Boothman flew round the course over the Solent in an S6B, which was similar to the S6 but fitted with an even more powerful Rolls-Royce " R " engine of 2,300 h.p. Boothman had the sky to himself and he flew the course with wonderful precision and accuracy, averaging 340·08 m.p.h. Some time afterwards this same machine, piloted by Flt. Lt. Stainforth, set up a world's record of 407·5 m.p.h.—nearly seven miles a minute !

But even Stainforth's performance was eclipsed a few years later. Italy,

SUCCESSFUL ORIGINALITY

Almost alone among the world's aircraft designers, Savoia-Marchetti have specialized in the twin-hulled flying boat, with the tail-unit carried on outriggers. This arrangement, they claim, gives greater stability on the water than the more orthodox single-hulled type. The S.55x (two Isotta-Fraschini engines), illustrated below, has certainly proved its worth, for it formed the equipment of Balbo's " Armada "

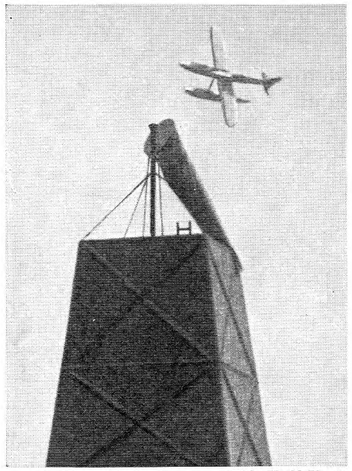




Topical

ORDEAL BY AIR AND WATER

The R.A.F. high-speed Flight, especially formed to compete in the Schneider Trophy races, was based before each race at Calshot, Hants, where intensive training was carried out. Before becoming accustomed to the newer and faster S6 type, the 1931 pilots flew the Supermarine S5, victorious in 1927. The S5 is seen taking off amidst clouds of spray



Wide World Photos

A 'FLY OVER'

With no foreign challenge for the Schneider Trophy in 1931, Great Britain, winners in 1927 and 1929, had only to fly over the Spithead course to win the Trophy outright. The pilot was Flt.-Lt. J. N. Boothman, here seen rounding the West Wittering pylon in the Supermarine S6B seaplane

who had been successful on three occasions (in 1920, 1921 and 1926) in the Schneider Trophy contests, was determined still to build the world's fastest aircraft.

The Italian designers, constructors and pilots were faced with a prodigious task, and at the outset they experienced serious difficulty in evolving an engine of sufficient power (for more speed meant more power) and reliability. There were many other problems that had to be solved in regard to the construction of the airframe, the floats, controlling surfaces and so forth. The Italian efforts had been marked, in the past, with disappointments, and marred by tragedy when some of their finest pilots were killed in testing new machines. But in spite of previous failure and obstacles a new record was made at 423·7 m.p.h.

The man who carried out this splendid achievement was Warrant-Officer Francesco Agello, the place Desenzano, Lake Garda, and the date April 10, 1933. Sixteen months afterwards the same pilot went out again on a record-shattering flight, and over a three-kilometre course above the tranquil waters of Garda made four runs to average the bewildering speed of 440·6 m.p.h. His machine was a Macchi-Castoldi 72, powered with a 24-cylinder 3,000 h.p. Fiat engine. So did high-speed flight reach an amazing climax in the thirty-first year of the aeroplane's existence.

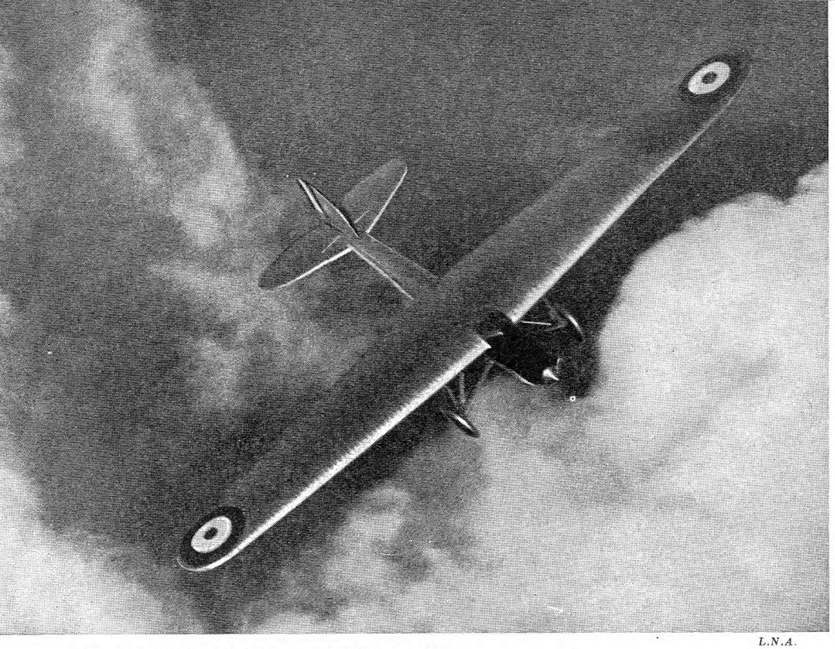
No less remarkable have been the records set up in long non-stop flights. One of Britain's finest efforts in this class was made in 1933, when two R.A.F. officers took off from Cranwell, Lincolnshire, and flew to Walvis Bay, in the British South-West African Protectorate. For this flight a special machine was designed and built by the Fairey Company. It was a large cantilever monoplane with a wing-span of 82 feet, and a Napier "Lion" XI.A engine of 530 h.p. The fuel was carried in tanks of 1,000 gallons capacity installed in the wing, and the all-up weight was 17,000 lb. The monoplane was very elaborately equipped for the flight, and was fitted with an " automatic pilot " for the purpose of relieving the crew of control from



Wide World Photos

SCHNEIDER TROPHY

Above is seen the Jacques Schneider Maritime Trophy for international competition. From the year of inception, 1913, when Prévost won at 45 m.p.h., to Britain's final triumph in 1931 at 340 m.p.h., the story of the race is one of courage, skill and constant progress



L.N.A.

TO SOUTH AFRICA NON-STOP

The record non-stop long-distance flight on the Fairey monoplane in February, 1932, had the backing of the State, and the pilots, Sqn. Ldr O. R. Gayford and Flt. Lt. G. E. Nicholetts, were serving R.A.F. officers. The Fairey, a specially-built machine with a single Napier "Lion" engine (see above), flew from Cranwell (Lincs.) to Walvis Bay, S.W. Africa, a distance of 5,309 miles, in 57½ hours. Below, Nicholetts (left) and Gayford (right) photographed at Cape Town, whither they had flown after their record-breaking feat

time to time during their long journey. The two officers selected for the attempt were Squadron Leader O. R. Gayford, A.F.C., and Flight Lieutenant G. E. Nicholetts, and after many months of delay, due to unfavourable weather conditions, they rose in their big machine from Cranwell at dawn on Monday, February 6, 1933. For all concerned the take-off, which occupied 58 seconds and entailed a run of 1,600 yards, was one of intense anxiety, for it was realized that any mischance in the way of sudden engine failure or collapse of a wheel would spell appalling disaster with the immense load of petrol that was being carried. The Fairey climbed very slowly and flew below low-lying clouds until Peterborough was passed. Then, the anxious period over, Gayford allowed his craft to climb.

At 10 a.m. the monoplane was near Paris, at noon it was over Lyons, and at 11.30 p.m., 520 miles south of Tunis. The journey to that point had been done easily and without incident at 100 m.p.h. The two men in their big machine flew on through the long hours of darkness, viewing an eerie scene from 8,000 feet. When daylight came they found themselves over desert country, but at 9 a.m. they passed over cultivated ground. Early in the afternoon Mount Cameroon, shrouded in clouds, came into view. Still the Fairey roared on.

As darkness fell once more the sky grew cloudy, and navigation and piloting became troublesome. To add to the airmen's difficulties the automatic pilot went out of action. For hours Gayford and Nicholetts flew blind, until with daybreak there came a clear sky and all was well once more. Now the machine was speeding along over undulating country, and at 7 a.m. the coastline was sighted. Gayford followed it. All through the morning the flight was continued, but the approaching exhaustion of the fuel supply meant that the end of the trip was not far off. And so at 4.40 p.m. at Walvis Bay the plane came down. Gayford and Nicholetts had kept a steady course for 5,309 miles, and had been aloft for 57 hours 25 minutes.

Record follows record in quick succession in flying, and before 1933 was out this flight was eclipsed by a wonderful non-stop trip made by Codos and Rossi, two well-known French airmen. Starting from New York on August 5, they flew in a Blériot machine to Rayak, Syria, a distance of 5,800 miles, in 54 hours 44 minutes.

The day after the French airmen had landed, General Balbo, with twenty-three Savoia-Marchetti S.55x flying boats, set out from Newfoundland on a return flight across the Atlantic to

Photopress





HISTORIC WINNERS OF THE WORLD'S GREATEST AIR RACE

The so-called "MacRobertson" Air Race in October, 1934, sponsored by Sir Macpherson Robertson, the Australian industrialist in connexion with the Melbourne Centenary, provided the greatest and most spectacular event in the history of aviation. Less than three days after leaving Mildenhall, Suffolk, the winners, C. W. A. Scott and T. Campbell Black, flew their D.H. "Comet" low over the finishing-line at the Melbourne racecourse, and afterwards landed at the nearby aerodrome of Laverton, where they are seen above. Below, Black (left) and Scott (right) before the start of the race

Photos: Associated Press





ITALY'S SPEED ACE

Lieut. Francesco Agello is the outstanding pilot of Italy's high-speed Flight at Desenzano, Lake Garda. He set up a world's air speed record of 440 m.p.h., in October, 1934, piloting a Macchi-Castoldi seaplane (see below)

Italy. This flight, and the outward journey that had been made in the previous month, was perhaps the most spectacular of all transatlantic achievements, for the big machines flew in formation and adhered to a prearranged schedule. It was a wonderful demonstration of efficiency, organization and reliability.

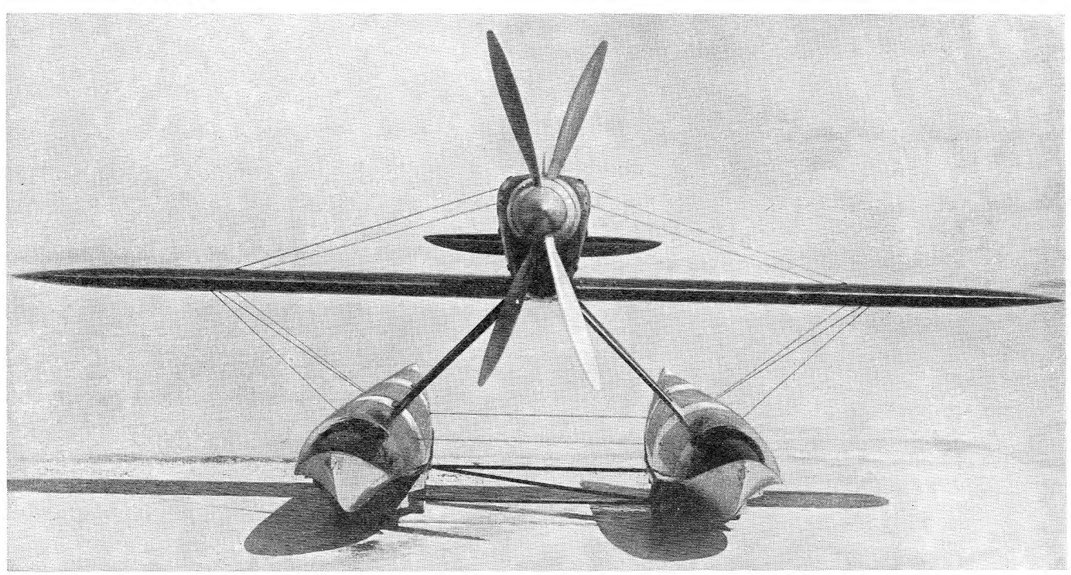
In striking contrast to this massed long-distance flight in which 100 airmen took part are the "lone" flights which are made from time to time by record-breaking pilots. One such achievement is the trip made by Flight Lieutenant "Tommy" Rose, D.F.C., veteran war-pilot and winner of the 1935 King's Cup air race. Leaving Lympne aerodrome on February 6, 1936, in a Miles Falcon Six he went via Malta, Cairo, Khartoum and Kisumu to Salisbury, South Africa. From there he went via Kimberley to Cape Town, and the whole journey occupied but 3 days 17 hours 37 minutes.

Yet though these flights by British, French and Italian airmen compel the greatest admiration, another made in 1934 overshadows even these magnificent achievements. This was the almost superhuman flight of C. W. A. Scott and his co-pilot T. Campbell Black in the great England-Australia contest for the MacRobertson Trophy. Never before had there been such a race; never before had men gone half-way round the world at such tremendous speeds.

At the start a score of machines were ready—small, low-powered light planes, powerful single-engined monoplanes and biplanes, air liners and special racing craft. Amongst the latter were three D.H. Comets, twin-engined low-wing monoplanes. One of these, named "Grosvenor House," was flown by Scott and Black. The engines were specially-prepared "Gipsy Sixes" placed outboard on the wings in streamlined cowlings. The span of the machine was 44 feet and the length 29 feet. The fuselage was narrow and carefully streamlined and held two large petrol tanks placed forward. Behind these sat the two pilots, tandemwise, in an enclosed cockpit with dual control. The undercarriage was of the retractable type, and could be raised so as to disappear completely within the engine fairings.

The Comet was purely a racing machine, and in the search for speed and a good range sacrifices had to be made in regard to comfort. Indeed, compared with the crew of such a machine as the Douglas the Comet pilots endured considerable hardships.

The great race started at Mildenhall, Suffolk, on the morning of October 20, 1934. It was an impressive and dramatic scene, set in the cold light of



SUPREME RACING SEAPLANE OF MODERN TIMES

Largely evolved from experience gained in designing seaplanes for the Schneider Trophy races, the Macchi-Castoldi 72 is the fastest aircraft of any description yet built. The clean lines and small frontal area of this amazing machine are evident in this photograph, which also shows the two airscrews fitted. These, revolving in opposite directions, counteract the terrific torque effect of the powerful engine, which consists of two 12-cylinder Fiat units placed end-to-end, and driving the airscrews through co-axial shafts. The total horse-power developed by this "two-in-one" engine amounts to nearly 3,000 h.p.



Photos: Keystone

THE 'FALCON' AND ITS MASTER

The Miles "Falcon," a light three-seater monoplane, won the King's Cup race of 1935 in the hands of Flight Lieut. T. Rose, the manufacturers' chief pilot. Above, the "Falcon" at Hatfield aerodrome, and, below (left), Rose with the famous trophy. Early in 1936 this combination of man and machine again proved itself by record flights to and from the Cape



the early morning, as one after another the aeroplanes gathered speed, climbed and turned into a sky streaked with the dawn. Silhouetted and scintillating they went their way and the race was on. In the very first stage ill luck overwhelmed a number of the competitors. Some came down in France, beaten by the weather. Others, as they made their way across Europe, landed with various mechanical defects. There were crashes and inevitable retirements. But Scott and Black roared on, to reach their first objective—Baghdad—at nine in the evening of the first day. They had covered the 2,530 miles at an amazing speed. Thirty-three minutes after their arrival they took their refuelled Comet off again with a course set for Karachi. Ahead of them was another Comet, the Mollisons' "Black Magic." Jim and Amy landed at Karachi and there met defeat with engine and undercarriage trouble.

Scott's Comet passed on, however, and without a stop came to Allahabad, touching down at a quarter past nine on Sunday morning. By that time it had covered 4,830 miles. Yet there were still more than 6,000 miles to be traversed, and other competitors were in hot pursuit. There was no time for rest, and so once more the Comet was taken off after a swift examination and replenishment of fuel. Singapore was the next stop after a tiring and nerve-fraying flight of twelve hours.

The two men were now faced with the most formidable section of all—the crossing of the Timor Sea en route for Darwin. Leaving Singapore at 11.3 p.m. on Sunday, Scott and Black set a direct course for the Australian port. By now they had a lead of 8 hours. Each man was stiff through sitting for long hours in the tiny enclosed cockpit; each was deaf through the roar of the motors. Unshaven, dirty, cramped and weary, they sat eagerly at their controls, goaded on by hopes of winning.

Then, at a most critical time, trouble developed. One engine faltered, slowed and seized up. Providentially, the other kept working and for 2½ hours the machine flew above the sea in this crippled state. A quick landing at Darwin, a feverish stripping-down of the damaged engine, a desperate patching up, and at 1.38 p.m. the Comet was in the air again, heading for Charleville, the penultimate stopping place. But after some time the trouble developed again. Once more hasty repairs were executed at Charleville.

The situation was critical, for the ailing engine was in a sorry state. Before landing at Charleville it had been totally out of action for a considerable time, and no one could tell whether the other unit would stand up to the strain of doing all the work, should another breakdown ensue.

Braced now for the final effort, Scott and his companion left the ground once again at 1 a.m. on Tuesday for the last leg of the race. The whole world waited for the news. It was known that their machine had been giving trouble. It was known that the second machine, the Dutch DC2 air liner, was not far behind. Would it be possible for Scott's luck to hold in the eleventh hour?

It did and at 5.30 a.m. on Tuesday, two days and 23 hours after it had taken off from Mildenhall, which lay 11,300 miles away, the Comet circled over Flemington racecourse, Melbourne, to win the greatest air race the world had ever known.

GENERAL INDEX

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LIST OF ERRATA

Page 27, col. 3, line 14—*for* 'Squadron,' *read* 'Wing.'
,, 27. col. 3, line 25—*delete* 'University College.'
,, 29, lower caption, line 3—*for* 'Lincs.' *read* 'Northants.'
,, 36 (facing), colour plate—The colours on the tail of Belgian and Italian aircraft *should read* black, yellow, red; and red, white, green, respectively. The insignia is not now usually painted on the wings of Italian aircraft.
,, 87–88—*for* 'Junkers 38' *read* 'Junkers G.38.'
,, 88, col. 1, line 11—*for* 'Juno' *read* 'Jumo.'
,, 92, caption, line 3—*for* '1918' *read* '1915.'
,, 111, lower caption, line 7—*for* 'Aldershorst' *read* 'Adlershorst.'
,, 134, caption, line 4—*should read* 'Below (left) Second-Lieutenant Brandon.'
,, 139, caption, line 3—*for* 'B' *read* 'B.E.'
,, 174, col. 1, caption, line 6, and 178, caption, line 5—*for* 'Arado' *read* 'Heinkel.'
Page 178, col. 1, line 10—*for* 'Arado' *read* 'Heinkel and Arado.'
,, 240, col. 1, lower caption, line 3—*for* 'D.3' *read* 'D.7.'
,, 247, col. 1, line 43—*for* 'Traffic' *read* 'Touring.'
,, 271, caption, line 3—*for* '270' *read* '269.'
,, 363, upper caption, line 1—*for* 'Gelgit' *read* 'Gilgit.'
,, 385, caption, line 4—*for* 'Estrehan' *read* 'Estreham.'
,, 386, col. 1, lines 9–10—*should read* 'Major J. T. B. McCudden.'
,, 392, caption, line 1—*for* '1935' *read* '1931.'
,, 394, lower caption, line 2—*for* 'Monte Cello' *read* 'Montecelio.'
,, 430, col 1, line 23—*for* 'Handysyde' *read* 'Handasyde.'
,, 433, col. 1, line 12—*for* 'B.E.26' *read* 'B.E.2c.'
,, 444—upper photo is of an early (1914 type) Zeppelin, probably LZ39.
,, 491, upper caption, line 4—*for* 'F.E.2c' *read* 'F.E.2b.'
,, 664, caption, line 3—*for* 'Shirke' *read* 'Shrike.'

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