Geoffrey DE HAVILLAND

A British Pioneer who Helped to Build up a Vast Industry

Extract from "Wonders of World Aviation" 1938

EDITORIAL NOTE: This article was written in the year preceding World War II consequently some of the comments may seem dated. We have refrained from heavily editing the dated remarks out, since they give an inkling of the thoughts of the writer at that time. They also reflect the era in which (Sir) Geoffrey de Havilland lived.

The subsequent history of de Havilland has been a glorious one, and the aircraft built during World War II have made their mark on history. The "wooden wonder" the plywood-balsa laminated de Havilland Mosquito helped win the air war against Germany and later, Japan. This aircraft was built on the experiences mentioned below with the de Havilland Comet and Albatross. A later Comet would be one of the first jet airliners and though ill-fated, the experience gained was unstintingly passed on to Boeing in later years. Such unselfish donations made sure that future airliners would not suffer fatigue cracks that had been the Comet's downfall. The ubiquitous Tiger Moth trained thousands of Allied airmen in the Dominion of Canada, and other Commonwealth countries. In Canada, the thriving de Havilland Aircraft of Canada went on to build the Beaver, Otter, Twin Otter and now in other hands builds the Dash 8 Series.

Before any aeroplane had flown more than a few yards in England, there were many potential aviators at work in various corners of the country. The year 1909 was to be a big year for aviation as a whole, particularly for Great Britain; many of the names which leaped to prominence that year will live as long as there are aeroplanes in the sky.

These men who had made up their minds to fly had no proper workshops; they chose the most convenient shed — and that meant a shed with a field adjoining it. In a shed near Fulham, London, assisted by F. T. Hearle (later General Manager of the De Havilland Aircraft Co., Ltd.), a young man named Geoffrey de Havilland was at work. Like most others engaged on the problems of flight, his tools were simple, and his materials crude compared with what goes to make up the aeroplane of today. The materials were cloth, wire, glue, iron brackets, odd lengths of wood and twine. Unlike many contemporaries, however, de Havilland was, even in those early days, a skilful workman.

As the months of 1909 passed, startling things happened in other parts of the country. S. F. Cody made an amazing flight of over 400 yards at Laflan's Plain, Aldershot, Hampshire, in February. A. V. Roe succeeded in making several spectacular flights with his triplane. But Geoffrey de Havilland kept steadily at his work; the wooden framework of his flying machine gradually took shape, and Mrs. de Havilland then took part in the great experiment, cutting out the cloth for wings, tail and control surfaces, and stitching it smoothly into place.

De Havilland was quick to see the greatest shortcomings of most machines then being built; their motors were either too large and heavy, or too small and insufficiently powerful. There was no suitable engine available for the machine he was building; so he set to work and built one for himself.

Towards the end of 1909 the machine was ready. They wheeled it out of its shed and started the engine. De Havilland climbed up into the seat, care-fully tested the controls and taxied about the grass. Everything seemed satisfactory and he opened the throttle.

The machine moved forward, made a series of convulsive leaps and crashed in a forlorn heap of tangled wood, metal and cloth. That was the whole story of the first great experiment— about six months of work destroyed in about six seconds.

Having cleared up the wreckage, de Havilland began work immediately on a second machine; the first was beyond repair. Nearly a year passed, and then people began to - hear of the name of de Havilland at Newbury, Berkshire. Quietly, carefully and methodically he had completed his new aeroplane at Highclere, and flown it near Newbury. How quietly he had set about making his share of aviation history may be judged from the following paragraph, taken from an aeronautical paper of the time.

"Some time ago an interesting machine and engine built by Mr. G. de Havilland, A.M.I.M.E., was illustrated and described. Mr. de Havilland has now built a new machine which is flying very well near Newbury. He is, we believe, the first man in this country to construct a machine, design the engine, and fly the combination himself. The machine has now been flying for about three weeks, and has

Christmas. Parents were very grateful that you thought of their children in this way. The volunteer distributors commented on the pleasure they experienced by observing the spontaneous responses on children's faces.

Nundle has recovered remarkably well from the flood. This recovery has been aided significantly by practical support from numerous outside organisations like the A.O.P.A. of Australia and business houses. Your contribution of toys helped to established a feeling of care and family among the citizens of our community.

Be assured, your thoughtfulness was greatly appreciated by the Nundle community, especially the children and parents.

Yours sincerely

Ted Warwick,

Contact Person, Nundle Shire Disaster Recovery Committee.

While it is nice to be acknowledged for the part we played in this appeal, the bulk of the credit should go to Christine Clissold of IUS Aviation Broking Services who inaugurated the appeal. She was ably assisted by the Bankstown Lions Club and operators, in particular Aurora Aviation, Clamback & Hennessy and the Alpha Group.- - The Editor.

Letters Policy

AOPA will publish letters to the Editor from AOPA members, providing they do not expose the Association to legal action, or have the potential to damage the Association in any way. Letters should be no more than 250 words and must be received by the 20th of the month prior to publication. One letter of more than 250 words may be published as the Long Letter of the Month. Sometimes a letter will not be published due to space considerations. In the event of the receipt of several letters on the one subject, the editor reserves the right to choose the letter that best reflects the general view. Normally, only one letter per member per month will be published, again due to a lack of space.

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several times made flights of two or three miles in length, at a height of between eighty and ninety feet."—October 12, 1910.

Thus de Havilland, trained as an engineer, had joined the ranks of the few and was already one of the founders of a great new industry. Most aviators of the time entered their machines for races and competitions held in Great Britain and on the Continent, but de Havilland was not interested in the spectacular side of aviation. He was too much occupied with the problems of design and construction to concern himself with record-breaking and the winning of prizes; he left that to others.

His attitude was soon rewarded. The Government, although then sceptical of aviation, decided to see, once and for all, whether there was anything in aeroplanes, and de Havilland was asked to cooperate. He was engaged to work in the Army Balloon Factory at Farnborough, Hampshire, at the end of 1910, with a commission to produce a suitable type of military aeroplane.

No better man could have been chosen for the task. De Havilland had already pinned his faith to the future of aircraft, and nothing could have discouraged him; the fact that his first machine never really flew at all, and that his second machine crashed almost as he took over his new post meant nothing. Such bad luck was to be expected. He set to work on a third machine as soon as he was installed at Farnborough, and it was completed towards the end of 1911. This third machine embodied much that he had learnt at his own expense in the preceding two years, and it was a successful aeroplane. It flew well— but it soon went the way of the others. A lieutenant crashed it beyond repair before it had time to prove anything to the authorities.

In the beginning of 1912 de Havilland built another machine of a new type. A tractor biplane, powered with a 70 horse-power Renault engine, it looked far more like the Gipsy Moth of the then distant future than anything else in the air at the time. It was sleek and streamlined, its fuselage was totally enclosed, and it was greatly ahead of anything else that had been built.

Much had happened behind the scenes between the wrecking of the third machine and the building of the fourth machine. The French Government, which had long realized the potentialities of a successful fighting aeroplane, had arranged a competitive meeting at Rheims in 1911, to find suitable types. More than £50,000 had been offered in prizes and, because of this, the entries had been varied and interesting, twenty-nine different makes being represented. British representatives, who had been detailed to attend the meeting to see exactly what was happening, returned full of enthusiasm, and proceeded to convince the various officials who were still unable to see any useful future for the aeroplane.

Thus, when de Havilland's new machine emerged from its shed in 1912 there were many important visitors to Farnborough, and a host of questions was asked about the status of British aviation. One direct result of these questions was the decision to hold a competitive meeting on Salisbury Plain later in the year. Meanwhile, however, the work of de Havilland received close attention. His next production at Farnborough was the BE type.



HIS FAITH IN HEAVIER-THAN-AIR MACHINES was rewarded when the British Government commissioned Geoffrey de Havilland to produce a suitable type of military aeroplane in 1910. In 1909 de Havilland was working in a shed in Fulham, London. Today the De Havilland Aircraft Co., Ltd.. is one of the largest aircraft manufacturing firms in Great Britain.

First Inspector of Aeroplanes

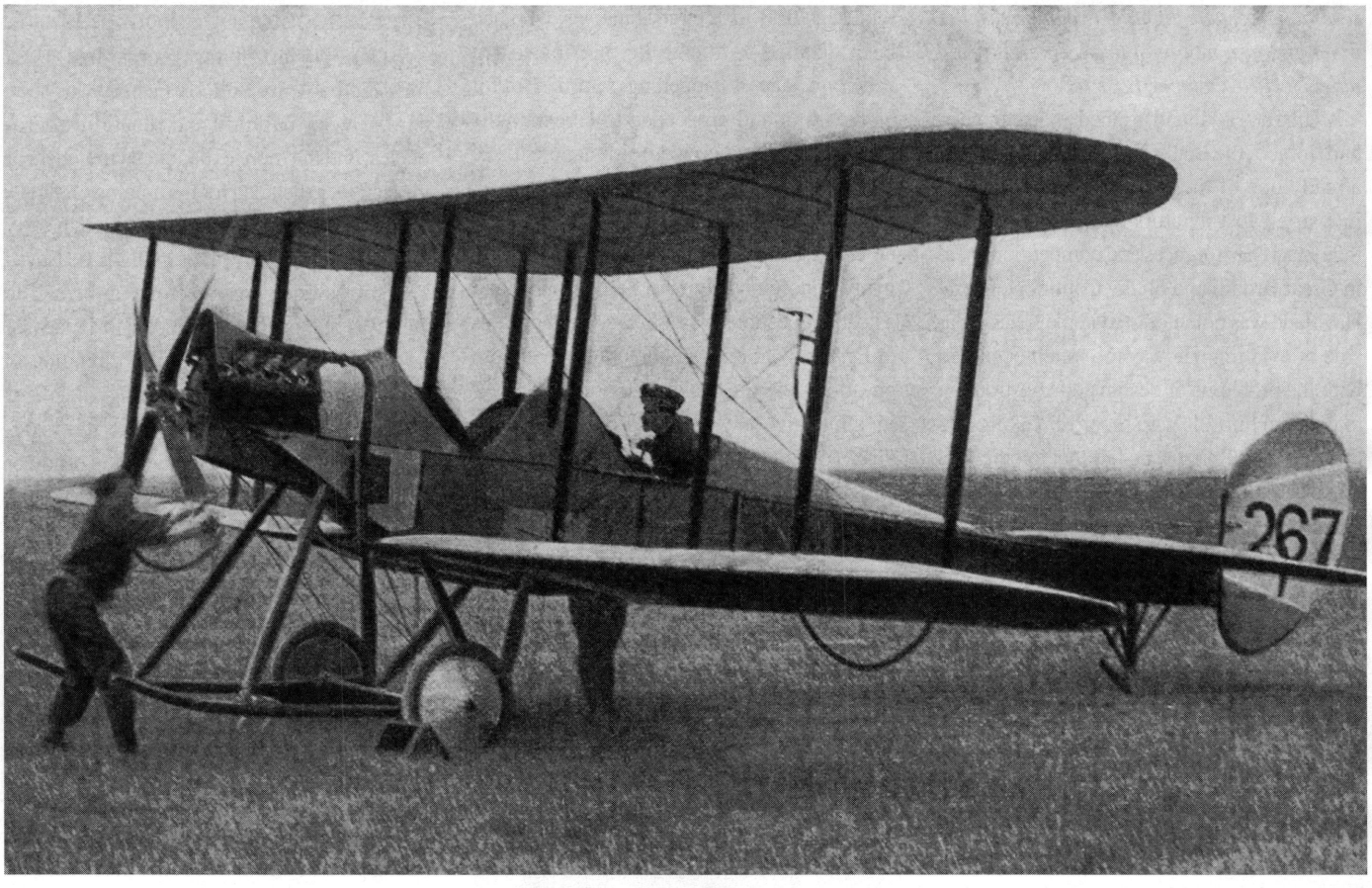
THE Royal Flying Corps had been formed, the Army Balloon Factory was soon hard at work building and rebuilding aeroplanes, and the more experienced members of the staff were detailed for the training of pupils.

King George V visited Farnborough early that year and saw three BEs in flight; de Havilland himself demonstrated one of them. The BE2 was his next product, and on this machine he put up an amazing flight of three hours' duration, with passenger, reaching a height of 10,560 feet. The aeroplane, like its predecessor, was powered with a 70 horse-power Renault engine. The British military trials, held on Salisbury Plain, were not so ambitious as the similar competition held in France, but they attracted a good variety of machines; nineteen aeroplanes competed, including nine foreign entries. Because the BE2 was the product of the Military Factory, it was debarred from competing. Colonel Cody won the trials, but the performance of the BE2, which was used for transport purposes on the Plain, showed that it was superior to most of the machines taking part. Its climb was better than many, its top speed of about 70 miles an hour compared very favourably with that of most entries, and its slow speed of 30 miles an hour would have earned it second place in that event.

By the spring of the following year, de Havilland had so improved the BE type that its speed was over 90 miles an hour, and several of these BE2s were in use by the Royal Flying Corps. After the BE2 came the BE2a, also designed by de Havilland, although by this time his new official post was Chief Test Pilot to the factory. Within four years of building his first experimental aeroplane this pioneer had been responsible for no fewer than nine different designs, the last of which was already being made in quantities by the Bristol Company under licence.

At the beginning of 1914, with the war clouds already forming on the horizon, de Havilland was appointed to a newly created post—Inspector of Aeroplanes. Again it was his quiet, efficient attitude to his job which gained him that position; his knowledge of aircraft construction was unique.

For six months he held the post of Inspector of Aeroplanes, and then he took up his second really important designing job. During those six months he examined and flew almost every type of aeroplane in production, and added to his already comprehensive knowledge a sound background of what to aim for in building aircraft and what to avoid. Mr. Holt Thomas, managing director of a firm ▶



The second B.E. built in 1912

named Airco, approached him with the offer of a post as chief designer. De Havilland accepted it. Though the war of 1914—18 intervened, this new post was the beginning of his real success, for it was under this regime that he designed the first of the long and famous D.H. series of aeroplanes.

During the war nearly 8,000 machines of the B.E., F.E., and R.E. types—all developments of his first tractor biplane—were produced by the Farnborough factory and under licence; the new D.H. series reached D.H.9 and D.H.9a, accounting in all for a similar total. To his credit, therefore, within nine years of his first experiment, were nearly 16,000 aeroplanes.

Such an achievement might well be regarded as a life's work well done. It was, however, the mere beginning of de Havilland's career. His real success began in 1920, when all civil aviation was at a standstill, and while the world was still gasping from the results of the four most terrible years in history. In 1920, again with the aid of Mr. Holt Thomas, the now famous De Havilland Aircraft Company was formed. The first Moth was produced in 1925, and in 1927 the firm began to build Gipsy engines.

Captain de Havilland's hobby is moth-collecting, and it is not surprising, therefore, that he should have christened his first neat and sturdy little craft the D.H. Moth. There was something very moth-like about it, and a group of the machines clustered round an aerodrome clubhouse—a familiar sight from the air in ensuing years—resembled a group of moths.

Gipsy Aero Engines

Graceful, reliable, and extremely safe, the Moth appealed to everyone interested in flying. It was reasonably priced and backed by an excellent service department. As a result, it began to sell in large numbers in all parts of the world.

While the Moth was still gaining in popularity the Puss Moth appeared on the market; this was a slightly more luxurious type of machine—a high-wing monoplane seating three in a comfortable cabin, comparable only with the refinements of a high-class motor car. Since then the Tiger Moth and the Leopard Moth have become equally well known, but it is the original Moth by which the De Havilland Company will always be remembered. The little machine performed praiseworthy feats in the hands of pilots in every corner of the globe; many a veteran "B" licence pilot began his career in one of the early Moths.

In all, several thousands were pro-duced before the type finally went out of production after ten years, to give way to the progressive demands of an air-minded public; but hundreds of the original model still exist.

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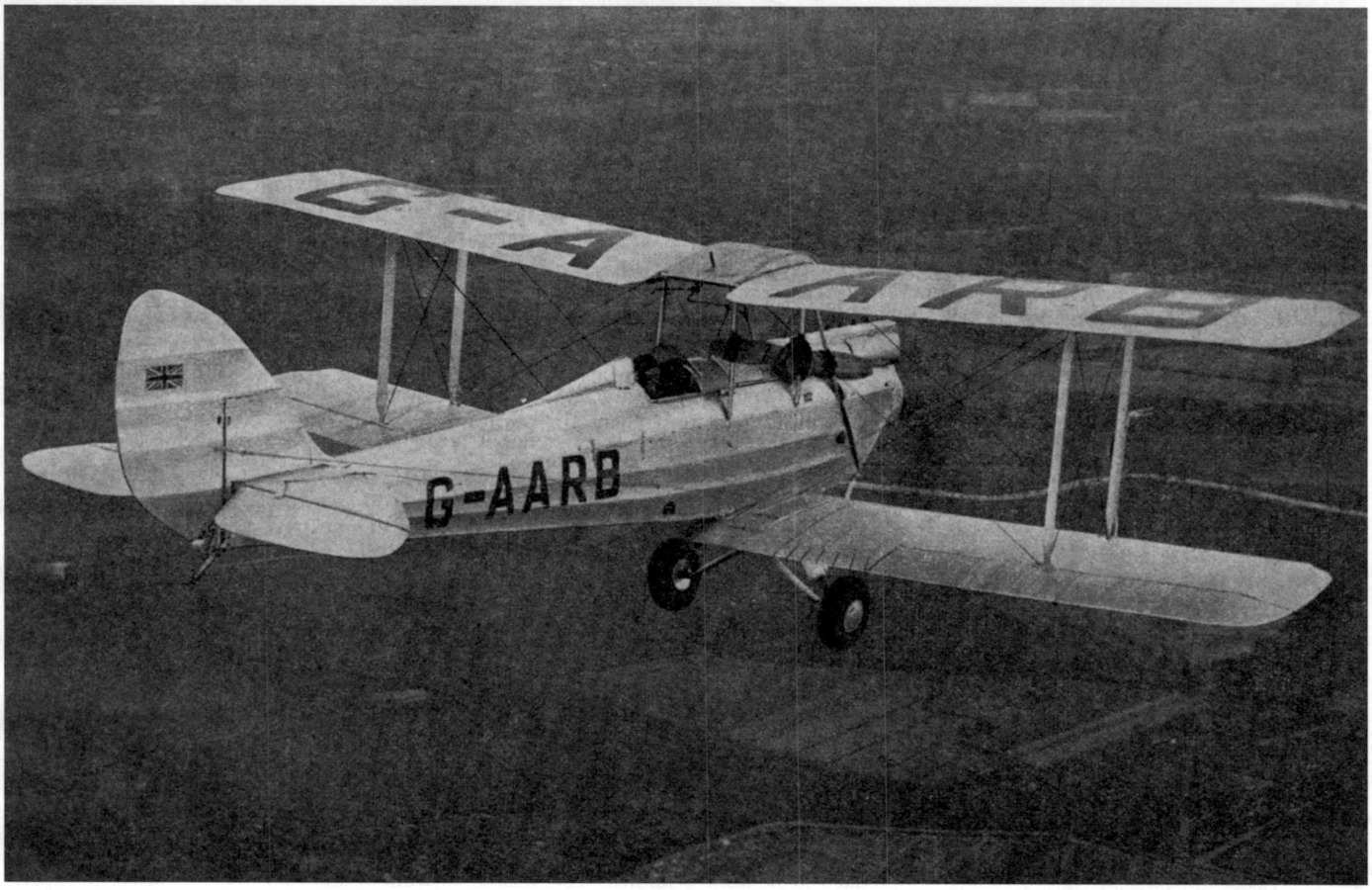
The Tiger Moth, which has taken the place of the original Moth, is now used as a civil and military training machine, and is suitable for initial tuition and for the advanced flying necessary for pilots who will handle high-powered aircraft.

No less successful—partly because it was linked inseparably with the Moth aeroplane—was the Gipsy aero engine. The original engine, the Gipsy I, is still manufactured to special order, but the name now covers a large and successful series, and more than 6,000 have been built. The Gipsy I was of 100 horse-power ; after it came the Gipsy II, of 110 horse-power, and the Gipsy III— an inverted engine with the crankcase above the cylinders. The Gipsy Major followed, with 130 horse-power, and then the Gipsy Six, Series one and two, giving a maximum horse-power of 200, the latter being designed for the latest advance, the variable pitch airscrew— the "gearbox" of the aeroplane.

So, from the first De Havilland aeroplane, built entirely by one man— air frame, engine and propeller—have evolved some of the most comfortable, economical, and reliable passenger machines of today and the firm of De Havilland, in which Captain de Havilland, assisted by F. T. Hearle, still takes the leading part, produces everything it requires, including air frames, engines and propellers.

De Havilland won the King's Cup Air Race in 1933, in a machine of his own design, and in the following year he was awarded the Royal Aeronautical Society's British Gold Medal for Aeronautics for his services to aeronautical science. In the same year, due to rapid expansion, the De Havilland aircraft factory moved from its old premises at Stag Lane aerodrome (Middlesex) to new and larger premises at Hatfield in Hertfordshire. The Stag Lane aerodrome has gone today, but the De Havilland workshops are still there, producing, instead of aeroplanes, Gipsy engines and De Havilland variable pitch airscrews. (*Now sadly long gone! Editor*)

The work of building aeroplanes, both new types and production models of standard types, is in full swing at Hatfield, and each month a group of new pupils is added to the ever-growing list. The De Havilland Dragon, Dragon Rapide, Tiger Moth, Hornet Moth, Leopard Moth, Dragonfly, the comparatively recent Albatross, and the Moth, may be seen ▶



A record flight to Australia. This D.H. Gypsy Moth was piloted by Miss Jean Batten in 1934, when she established a record of less than fifteen days. In the following year she made a successful flight back to England.

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The prototype of the Albatross on the tarmac at Hatfield, Hertfordshire. Designed for transatlantic flights the Albatross represents one of the most recent advances in British civil aviation. This low-wing monoplane is driven by four Gipsy Twelve engines of 500-550 horse-power, through controllable pitch airscrews.

in the air almost any day at Hatfield, and from the modern factory buildings new machines leave regularly for all parts of the world; machines for private owners at home and abroad, and air liners which have been ordered by passenger and mail services in different countries.

The Queen Bee radio-controlled aeroplane is a variation of the Moth, fitted with special control apparatus from the Government factory. This machine, which is of an entirely novel type is under the complete control of radio signals from its take-off until the landing— both of which can be effected by remote radio control.

Controllable Pitch Airscrews

A D.H. machine which attracted a great deal of notice in 1935 was the famous Comet. The Comet was specially designed in the D.H. factory to win the England—Australia Air Race of 1934, which it did. (*The Great Air Race From London to Melbourne will be commemorated this year, 2001 with a New Race from Biggin Hill UK to Sydney, described elsewhere in this month's AOPA Magazine – Editor*). Compare, however, a picture of the Comet with that of the Albatross, which appeared some two years later, and there will be found one of the most interesting sidelights on present-day design and development. No one will fail to see the similarity, or to recognize the same artistic touch. The thousand and -one small details which were learned from the Comet are only of interest to the designer, but it is good to see that the bold move of producing a mere handful of aeroplanes—and expensive ones—for an air race has been so well rewarded.

De Havilland built his first airscrew in 1909. In 1935 the De Havilland Company produced, under the Hamilton patents, the first De Havilland controllable pitch airscrew—an ingenious arrangement by which the angle of the propeller blades can be changed during flight, either automatically or by the movement of a small lever in the cabin. This represented an entirely new branch of the industry for the firm. The first plant for production of these propellers consisted of twelve machines, eighteen men comprising the staff. Within two years the plant had become the biggest producer in the world of all-metal controllable pitch airscrews.

Controllable pitch airscrews for the Short Empire flying boats have a diameter of 12 ft. 9 in., yet so beautifully are they balanced that the weight of a small piece of paper is sufficient to turn them. The spirit of progress is behind every department of the factories ; yet, in spite of the changing times, and the army of men who now carry out the designs of others, there still exists a friendly atmosphere, which is strangely reminiscent of that small shed rented at Fulham in 1909, for the purpose of building an aeroplane; for example, take the following paragraph concerning the first flight of the Albatross.

At the sound of the works siren everybody in the entire factory turned out to witness the take-off of this beautiful craft, on which many of them had been working for several months. That was on May 20, 1937. On June 22, 1937: "Captain Geoffrey de Havilland piloted the 94th aircraft of his own design, a small two-seater, low-wing monoplane, on its first flight. This machine, the D.H.94, has been built for the purpose of subjecting to full-scale flying tests certain technical and structural features in which Captain de Havilland is interested. It is fitted with a Gipsy Minor four-cylinder engine of about 75 h.p., a power unit that was developed experimentally five years ago, and happens to be of convenient size for research work of this kind. Whether tests and experiments with the D.H.94 may suggest the basis of a design of aeroplane which would be suitable to put into production cannot at present be conjectured."

It is still undecided at the time of writing whether any important develop-ments will follow the tests of the D.H.94; but it is safe to say that, in some way or other, aviation will benefit from the initial work. Nothing is wasted at the De Havilland factory, and because a type is not put straight into produc-

tion it does not mean that the world will not see the results of all that has gone into its creation. A good example of this may probably be found in the D.H.92.

The D.H.92 was the next design to be evolved after the DH.91, the Alba-tross, but the D.H.92 was put aside for excellent reasons. It was a Dragon Rapide replacement—a biplane powered by two Gipsy Six Series II engines, with retractable under-carriage, flap gear, controllable pitch airscrews and side-by-side dual control. It was a superior and up-to-date machine in every way. At the time of its evolution, however. extreme pressure of work at the factory caused its designers to put it to one side. This could not be put into quantity production at once ; and they realized that, by the time they would be able to put it into full production, pro-gress might have already dated it. So, for the moment at any rate, the D.H.92 remains a number in the firm's books.

Features of the Later Designs

THE D.H.93, which followed the D.H.92, is in course of full production. Known as the Don Trainer, it is a low-wing monoplane fitted with retract-able undercarriage and every other modern device, a special feature being its rotating gun turret. (*An unsuccessful departure for de Havillands – Editor*)

The Albatross, with a range of 1,000 miles, offers the operating companies a useful payload of 4,200 lb.; this includes accommodation for twenty-three passengers, and allows for a crew of four. Such a machine is too big for the smaller services, and so the D.H.95 has been designed on similar but smaller lines. The idea behind it was to produce a fast machine with a high safety factor, particularly with regard to take-off and climb. It is a high-wing monoplane, with retractable under-carriage.

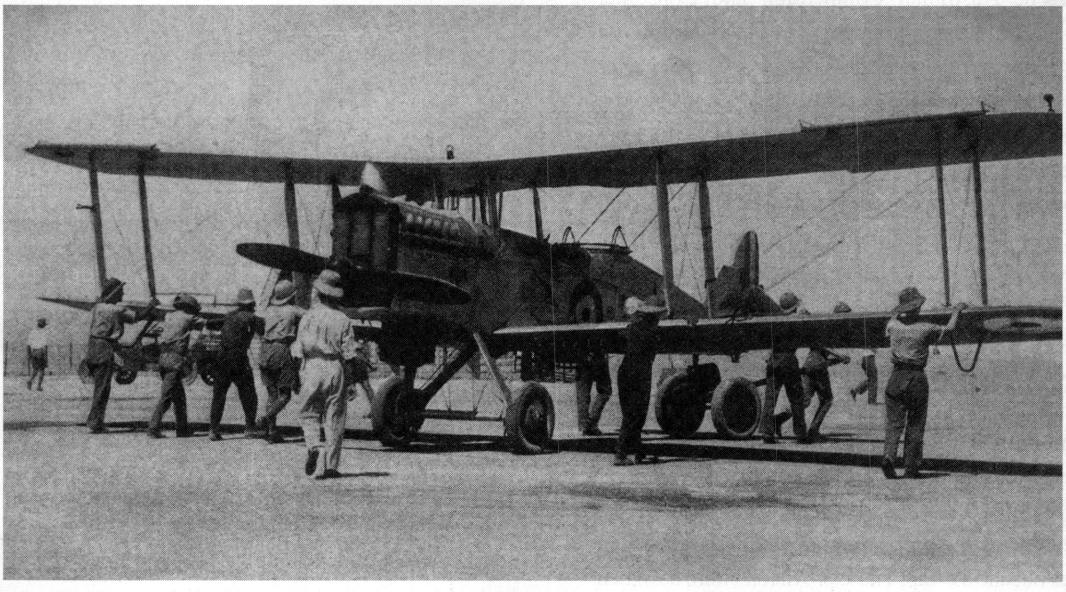
The D.H.95 represents an important event in the history of the De Havilland Company. It is the first machine of the long line to be built entirely of metal. Anticipating the findings of the Cadrnan Committee, the designers realized that with increased subsidies there would be a much bigger market for a medium-sized high-speed machine. Moreover, as it is cheaper to build entirely of metal—in quantities—the D.H.95 was planned accordingly. Two Bristol engines were chosen, because to adapt the design to Gipsy engines would have meant building the machine either larger or smaller.

It took the De Havilland Company ten years to develop its in-line type of engine to its present superb performance, and at least two or three years were needed to evolve the latest Gipsy Twelve, which, after all, is but a double Gipsy Six. It would, therefore, have taken years to develop an entirely new engine of the required power.

Thus, thirty years after his first experiments, de Havilland continues to work hard for the improvement of flying—to which he pinned his faith at the beginning. Few men have done so much for aviation.

EDITORIAL NOTE:

Geoffrey de Havilland was knighted for his services to his country, and rightly so too. Sir Geoffrey de Havilland also lost a son to the crash of the experimental flying wing aircraft, the DH 108, a loss that must have grieved the great aviation pioneer deeply. Editor ✈



Wheeling out a D.H. 9a at Amman, Transjordan, during the war of 1914-18. During these years de Havilland produced ten D.H. types, the D.H. 9a being a modification of the D.H.9., which, engined by a Siddeley Puma of 200 horse-power, attained a speed of 110 miles an hour at 10,000 feet.

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ISION ON APRON

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PORT

he Australian Competition and Consumer Commission today issued its decision on Canberra Airport's proposals to increase charges to fund a major apron expansion at the airport.

he decision is to approve a charge or $0.589 per g and departing passenger.

he decision allows construction of additional aircraft g bays to service airline operating requirements at port", ACCC Chairman, Professor Allan Fels, said "The new apron is a common user facility that will ilable to all airlines. It will cater for Impulse Airlines her new entrants as well as catering for growth by s and Ansett.

he regulatory arrangements covering Canberra t and other price-capped airports allow airport oper- o apply to the ACCC to recover the costs or neces- ew infrastructure expenditure through charging ses outside the cap. These provisions were designed vide incentives for the timely development of neces- ew aeronautical infrastructure.

he new investment provisions encourage airport tors and users to consult on the investment needs of rports and the prices associated with the new investments.

"In this case not all users agreed on the need for the apron expansion. Ansett and Impulse supported the project. while Qantas did not. The lack of agreement made the ACCC's consideration of Canberra Airport's proposals more difficult. The operational issues involved need to be resolved by the industry. In this instance Canberra Airport Impulse and Insight undertook detailed consultation. Qantas did not participate in the process. I encourage all parties to work together to resolve the issues.

"The charge approved is lower than the charge proposed by Canberra Airport. The reason for this is that the ACCC's decision adopts a lower rate or return and lower land rental charges than proposed. Also coasts associated with the development of a Master Plan were excluded.

"In making its decision, the ACCC expressed reservations about the charging structure proposed. Canberra Airport opted for a per passenger charge. However, passenger numbers do not accurately reflect resource consumption. Aircraft size and weight are the primary drivers of apron costs. Aircraft MTOW (maximum take-off weight) based charges capture this more effectively than passenger based charges. For this reason the ACCC encourages CAG to reconsider its approach and consult further with airlines."

Copies of the decision will be available on the ACCC web-site (www.accc.gov.au) on the airports page.

Further information

Professor Allan Fels. Chairman. ACCC, (03) 9290 1612 or new pager (02) 6285 6170

Ms Lin Enright, Director, Public Relations (02) 6243 1108 or (0414) 613 520 ✈

GEOFFREY DE HAVILLAND

A British Pioneer who Helped to Build up a Vast Industry

BEFORE any aeroplane had flown more than a few yards in England, there were many potential aviators at work in various corners of the country. The year 1909 was to be a big year for aviation as a whole, particularly for Great Britain; many of the names which leaped to prominence in that year will live as long as there are aeroplanes in the sky.

These men who had made up their minds to fly had no proper workshops; they chose the most convenient shed—and that meant a shed with a field adjoining it. In a shed near Fulham, London, assisted by F. T. Hearle (later General Manager of the De Havilland Aircraft Co., Ltd.), a young man named Geoffrey de Havilland was at work. Like most others engaged on the problems of flight, his tools were simple, and his materials crude compared with what goes to make up the aeroplane of today. The materials were cloth, wire, glue, iron brackets, odd lengths of wood and twine. Unlike many contemporaries, however, de Havilland was, even in those early days, a skilful workman.

As the months of 1909 passed, startling things happened in other parts of the country. S. F. Cody made an amazing flight of over 400 yards at Laffan's Plain, Aldershot, Hampshire, in February. A. V. Roe succeeded in making several spectacular flights with his triplane (*see* page 204). But Geoffrey de Havilland kept steadily at his work; the wooden framework of his flying machine gradually took shape, and Mrs. de Havilland then took part in the great experiment, cutting out the cloth for wings, tail and control surfaces, and stitching it smoothly into place.

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Having cleared up the wreckage, de Havilland began work immediately on a second machine; the first was beyond repair. Nearly a year passed, and then people began to hear of the name of de Havilland at Newbury, Berkshire. Quietly, carefully and methodically he had completed his new aeroplane, at Highclere, and flown it near Newbury. How quietly he had set about making his share of aviation history may be judged from the following paragraph, taken from an aeronautical paper of the time:

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No better man could have been chosen for the task. De Havilland had already pinned his faith to the future of aircraft, and nothing could have discouraged him; the fact that his first machine never really flew at all, and that his second machine crashed



Photo, Flight

HIS FAITH IN HEAVIER-THAN-AIR MACHINES was rewarded when the British Government commissioned Geoffrey de Havilland to produce a suitable type of military aeroplane in 1910. In 1909 de Havilland was working in a shed in Fulham, London. Today the De Havilland Aircraft Co., Ltd., is one of the largest aircraft manufacturing firms in Great Britain.

almost as he took over his new post meant nothing. Such bad luck was to be expected. He set to work on a third machine as soon as he was installed at Farnborough, and it was completed towards the end of 1911. This third machine embodied much that he had learnt at his own expense in the preceding two years, and it was a successful aeroplane. It flew well—but it soon went the way of the others. A lieutenant crashed it beyond repair before it had time to prove anything to the authorities.

In the beginning of 1912 de Havilland built another machine of a new type. A tractor biplane, powered with a 70 horse-power Renault engine, it looked far more like the Gipsy Moth of the then distant future than anything else in the air at the time. It was sleek and streamlined, its fuselage was totally enclosed, and it was greatly ahead of anything else that had been built.

Much had happened behind the scenes between the wrecking of the third machine and the building of the fourth machine. The French Government, which had long realized the potentialities of a successful fighting aeroplane, had arranged a competitive meeting at Rheims in 1911, to find suitable types. More than £50,000 had been offered in prizes and, because of this, the entries had been varied and interesting, twenty-nine different makes being represented. British representatives, who had been detailed to attend the meeting to see exactly what was happening, returned full of enthusiasm, and proceeded to convince the various officials who were still unable to see any useful future for the aeroplane.

Thus, when de Havilland's new machine emerged from its shed in 1912 there were many important visitors to Farnborough, and a host of questions was asked about the status of British aviation. One direct result of these questions was the decision to hold a competitive meeting on Salisbury Plain later in the year. Meanwhile, however, the work of de Havilland received close attention. His next production at Farnborough was the BE (Blériot Experimental) type.

First Inspector of Aeroplanes

THE Royal Flying Corps had been formed, the Army Balloon Factory was soon hard at work building and rebuilding aeroplanes, and the more experienced members of the staff were detailed for the training of pupils.

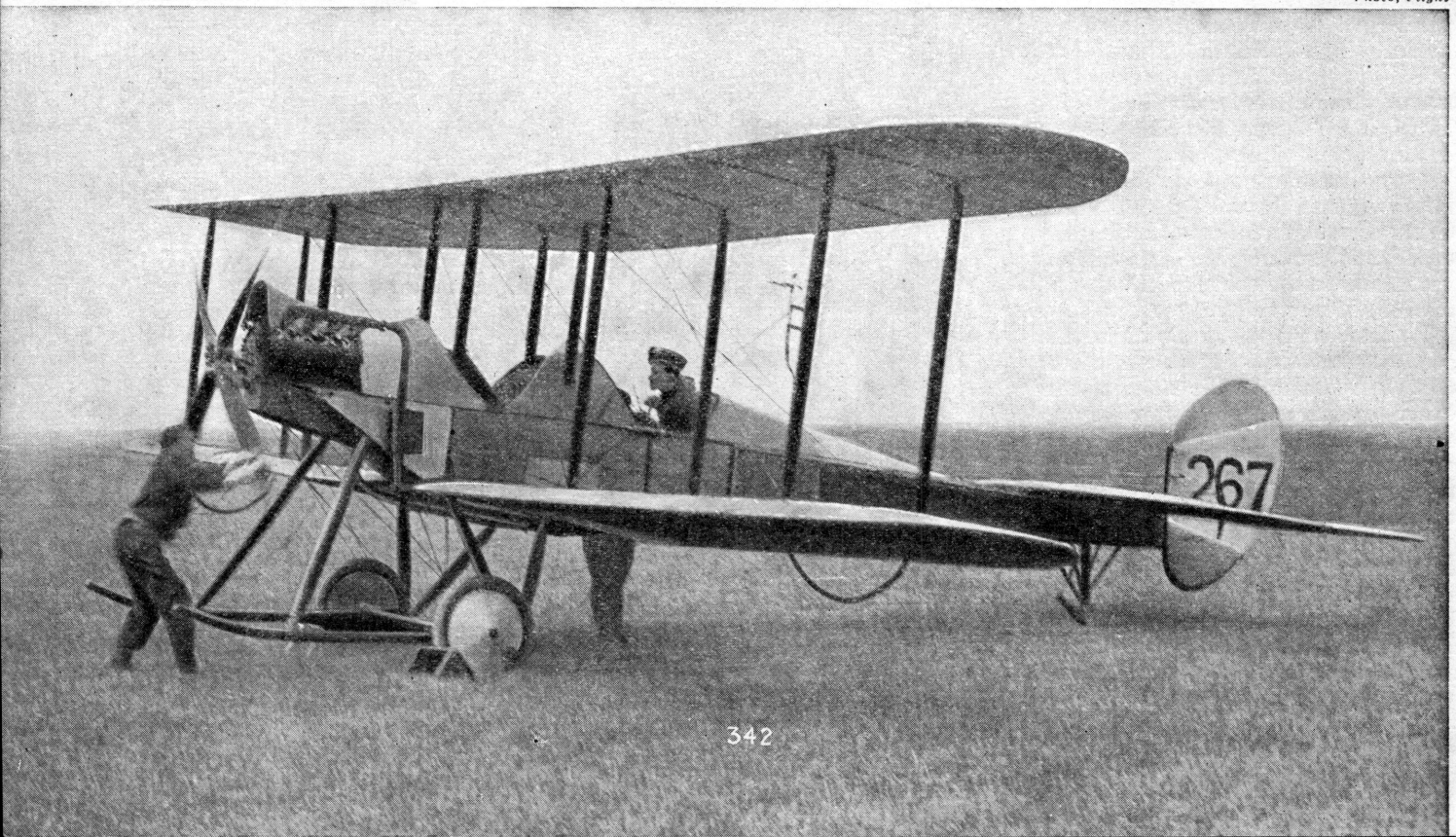
King George V visited Farnborough early that year and saw three BEs in flight; de Havilland himself demonstrated one of them. The BE2 was his next product, and on this machine he put up an amazing flight of three hours' duration, with passenger, reaching a height of 10,560 feet. The aeroplane, like its predecessor, was powered with a 70 horse-power Renault engine. The British military trials, held on Salisbury Plain, were not so ambitious as the similar competition held in France, but they attracted a good variety of machines; nineteen aeroplanes competed, including nine foreign entries. Because the BE2 was the product of the Military Factory, it was debarred from competing. Colonel Cody won the trials, but the performance of the BE2, which was used for transport purposes on the Plain, showed that it was superior to most of the machines taking part. Its climb was better than many, its top speed of about 70 miles an hour compared very favourably with that of most entries, and its slow speed of 30 miles an hour would have earned it second place in that event.

By the spring of the following year, de Havilland had so improved the BE type that its speed was over 90 miles an hour, and several of these BE2s were in use by the Royal Flying Corps. After the BE2 came the BE2a, also designed by de Havilland, although by this time his new official post was Chief Test Pilot to the factory. Within four years of building his first experimental aeroplane this pioneer had been responsible for no fewer than nine different designs, the last of which was already being made in quantities by the Bristol Company under licence.

At the beginning of 1914, with the war clouds already forming on the horizon, de Havilland was appointed to a newly created post—Inspector of Aeroplanes. Again it was his quiet,

THE SECOND BLÉRIOT EXPERIMENTAL MACHINE, the BE2, was designed and built by de Havilland at Farnborough in 1912. In this machine de Havilland made a flight of three hours' duration, with a passenger. He reached a height of 10,560 feet. The machine was powered by a Renault engine of 70 horse-power.

Photo, Flight





THE PROTOTYPE OF THE ALBATROSS on the tarmac at Hatfield, Hertfordshire. Designed for transatlantic flights the Albatross represents one of the most recent advances in British civil aviation. This low-wing monoplane is driven by four Gipsy Twelve engines of 500-550 horse-power, through controllable pitch airscrews.

efficient attitude to his job which gained him that position; his knowledge of aircraft construction was unique.

For six months he held the post of Inspector of Aeroplanes, and then he took up his second really important designing job. During those six months he examined and flew almost every type of aeroplane in production, and added to his already comprehensive knowledge a sound background of what to aim for in building aircraft and what to avoid. Mr. Holt Thomas, managing director of a firm named Airco, approached him with the offer of a post as chief designer. De Havilland accepted it. Though the war of 1914–18 intervened, this new post was the beginning of his real success, for it was under this regime that he designed the first of the long and famous D.H. series of aeroplanes.

During the war nearly 8,000 machines of the B.E., F.E., and R.E. types—all developments of his first tractor biplane—were produced by the Farnborough factory and under licence; the new D.H. series reached D.H.9 and D.H.9a, accounting in all for a similar total. To his credit, therefore, within nine years of his first experiment, were nearly 16,000 aeroplanes.

Such an achievement might well be regarded as a life's work well done. It was, however, the mere beginning of de Havilland's career. His real success began in 1920, when all civil aviation was at a standstill, and while the world was still gasping from the results of the four most terrible years in history. In 1920, again with the aid of Mr. Holt Thomas, the now famous De Havilland Aircraft Company was formed. The first Moth was produced in 1925, and in 1927 the firm began to build Gipsy engines.

Captain de Havilland's hobby is moth-collecting, and it is not surprising, therefore, that he should have christened his first neat and sturdy little craft the D.H. Moth. There was something very moth-like about it, and a group of the machines clustered round an aerodrome clubhouse—a familiar sight from the air in ensuing years—resembled a group of moths.

Gipsy Aero Engines

GRACEFUL, reliable, and extremely safe, the Moth appealed to everyone interested in flying. It was reasonably priced and backed by an excellent service department. As a result, it began to sell in large numbers in all parts of the world.

While the Moth was still gaining in popularity the Puss Moth appeared on the market; this was a slightly more luxurious type of machine—a high-wing monoplane seating three in a comfortable cabin, comparable only with the refinements of a high-class motor car. Since then the Tiger Moth and the Leopard Moth have become equally well known, but it is the original Moth by which the De Havilland Company will always be remembered. The little machine performed praiseworthy feats in the hands of pilots in every corner of the globe; many a veteran "B" licence pilot began his career in one of the early Moths.

In all, several thousands were produced before the type finally went out of production after ten years, to give way to the progressive demands of an air-minded public; but hundreds of the original model still exist.

The Tiger Moth, which has taken the place of the original Moth, is now used as a civil and military training machine, and is suitable for initial tuition and for the advanced flying necessary for pilots who will handle high-powered aircraft.

No less successful—partly because it was linked inseparably with the Moth aeroplane—was the Gipsy aero engine. The original engine, the Gipsy I, is still manufactured to special order, but the name now covers a large and successful series, and more than 6,000 have been built. The Gipsy I was of 100 horse-power; after it came the Gipsy II, of 110 horse-power, and the Gipsy III—an inverted engine with the crankcase above the cylinders. The Gipsy Major followed, with 130 horse-power, and then the Gipsy Six, series one and two, giving a maximum horse-power of 200, the latter being designed for the latest advance, the variable pitch airscrew—the "gearbox" of the aeroplane.

So, from the first De Havilland aeroplane, built entirely by one man—

air frame, engine and propeller—have evolved some of the most comfortable, economical, and reliable passenger machines of today: and the firm of De Havilland, in which Captain de Havilland, assisted by F. T. Hearle, still takes the leading part, produces everything it requires, including air frames, engines and propellers.

De Havilland won the King's Cup Air Race in 1933, in a machine of his own design, and in the following year he was awarded the Royal Aeronautical Society's British Gold Medal for Aeronautics for his services to aeronautical science. In the same year, due to rapid expansion, the De Havilland aircraft factory moved from its old premises at Stag Lane aerodrome (Middlesex) to new and larger premises at Hatfield in Hertfordshire. The Stag Lane aerodrome has gone today, but the De Havilland workshops are still there, producing, instead of aeroplanes, Gipsy engines and De Havilland variable pitch airscrews.

The work of building aeroplanes, both new types and production models of standard types, is in full swing at Hatfield, and each month a group of new pupils is added to the ever-growing list. The De Havilland Dragon, Dragon Rapide, Tiger Moth, Hornet Moth, Leopard Moth, Dragonfly, the comparatively recent Albatross, and the Moth, may be seen in the air almost any day at Hatfield, and from the modern factory buildings new machines leave regularly for all parts of the world; machines for private owners at home and abroad, and air liners which have been ordered by passenger and mail services in different countries.

The Queen Bee radio-controlled aeroplane is a variation of the Moth, fitted with special control apparatus from the Government factory. This machine, which is of entirely novel type is under, the complete control of radio signals from its take-off until the landing—both of which can be effected by remote radio control. Details of the working parts of the Queen Bee are not available.

Controllable Pitch Airscrews

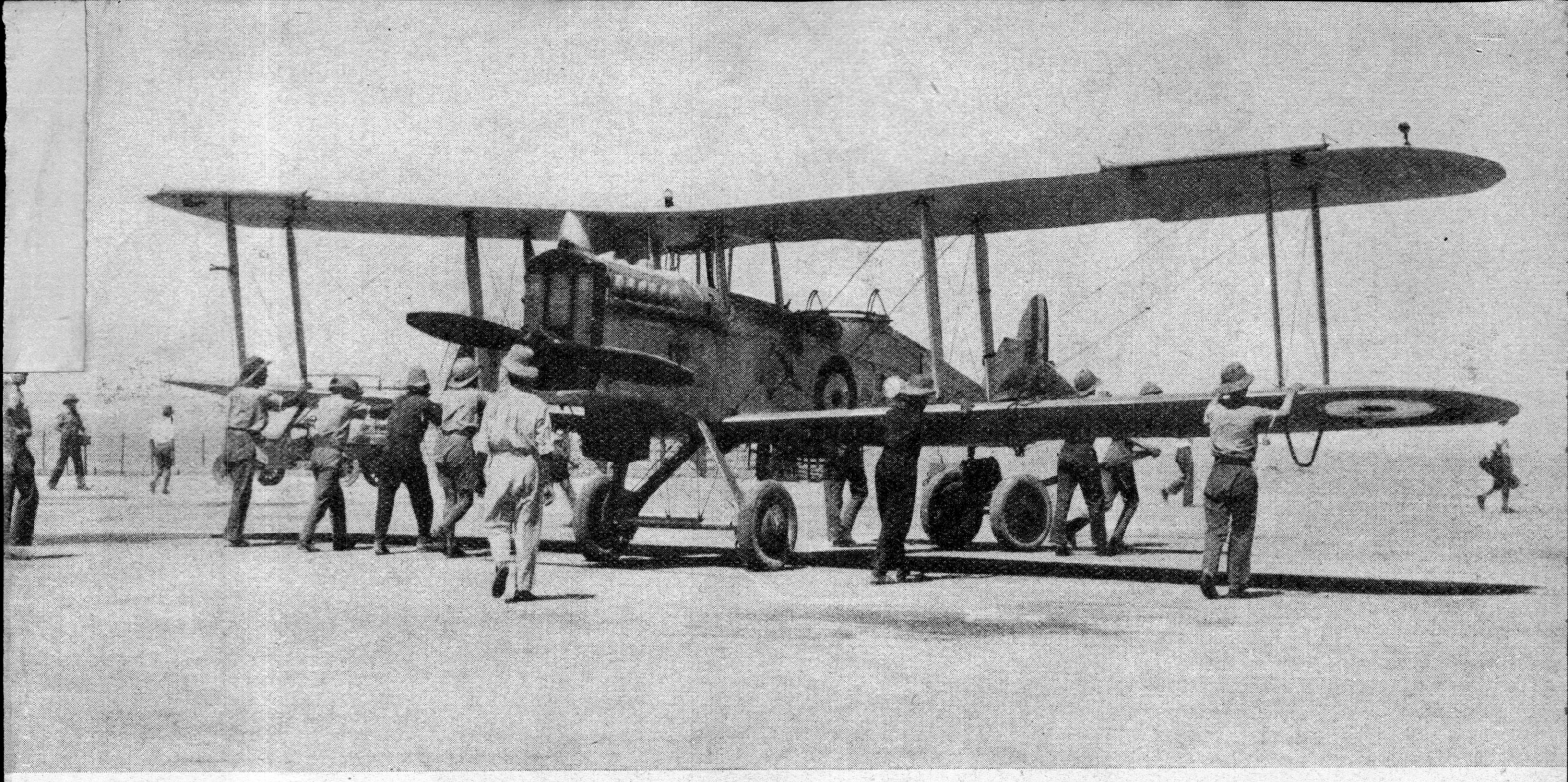
A D.H. machine which attracted a great deal of notice in 1935 was the famous Comet. The Comet was specially designed in the D.H. factory to win the England–Australia Air Race of 1934, which it did. (*See page* 196). Compare, however, a picture of the Comet with that of the Albatross, which appeared some two years later, and there will be found one of the most interesting sidelights on present-day design and development. No one will fail to see the similarity, or to recognize the same artistic touch. The thousand and one small details which were learned from the Comet are only of interest to the designer, but it is good to see that the bold move of producing a mere handful of aeroplanes—and expensive ones—for an air race has been so well rewarded.

De Havilland built his first airscrew in 1909. In 1935 the De Havilland Company produced, under the Hamilton patents, the first De Havilland controllable pitch airscrew—an ingenious arrangement by which the angle of the propeller blades can be changed during flight, either automatically or by the movement of a small lever in the cabin. This represented an entirely new branch of the industry for the firm. The first plant for production of these propellers consisted of twelve machines, eighteen men comprising the staff. Within two years the plant had become the biggest producer in the world of all-metal controllable pitch airscrews.

Controllable pitch airscrews for the Short Empire flying boats have a diameter of 12 ft. 9 in., yet so beautifully are they balanced that the weight of a small piece of paper is sufficient to turn them. The spirit of progress is behind every department of the factories; yet, in spite of the changing times, and the army of men who now carry out the designs of others, there still exists a friendly atmosphere, which is strangely reminiscent of that small shed rented at Fulham in 1909, for the purpose of building an aeroplane; for

ON A RECORD FLIGHT TO AUSTRALIA. This D.H. Gipsy Moth was piloted by Miss Jean Batten in 1934, when she established a record of less than fifteen days. In the following year she made a successful flight back to England.





WHEELING OUT A D.H.9a at Amman, Transjordan, during the war of 1914-18. During these years de Havilland produced ten D.H. types, the D.H.9a being a modification of the D.H.9., which, engined by a Siddeley Puma of 200 horse-power, attained a speed of 110 miles an hour at 10,000 feet.

example, take the following paragraph concerning the first flight of the Albatross :

" . . . . At the sound of the works siren everybody in the entire factory turned out to witness the take-off of this beautiful craft on which many of them had been working for several months. . . . . " That was on May 20, 1937. On June 22, 1937 : " Captain Geoffrey de Havilland piloted the 94th aircraft of his own design, a small two-seater, low-wing monoplane, on its first flight. This machine, the D.H.94, has been built for the purpose of subjecting to full-scale flying tests certain technical and structural features in which Captain de Havilland is interested. It is fitted with a Gipsy Minor four-cylinder engine of about 75 h.p., a power unit that was developed experimentally five years ago, and happens to be of convenient size for research work of this kind. Whether tests and experiments with the D.H.94 may suggest the basis of a design of aeroplane which would be suitable to put into production cannot at present be conjectured."

It is still undecided at the time of writing whether any important developments will follow the tests of the D.H.94 ; but it is safe to say that, in some way or other, aviation will benefit from the initial work. Nothing is wasted at the De Havilland factory, and because a type is not put straight into production it does not mean that the world will not see the results of all that has gone into its creation. A good example of this may probably be found in the D.H.92.

The D.H.92 was the next design to be evolved after the D.H.91, the Albatross, but the D.H.92 was put aside for excellent reasons. It was a Dragon Rapide replacement—a biplane powered by two Gipsy Six Series II engines, with retractable undercarriage, flap gear, controllable pitch airscrews and side-by-side dual control. It was a superior and up-to-date machine in every way. At the time of its evolution, however, extreme pressure of work at the factory caused its designers to put it to one side. This could not be put into quantity production at once ; and they realized that, by the time they would be able to put it into full production, progress might have already dated it. So, for the moment at any rate, the D.H.92 remains a number in the firm's books.

Features of the Later Designs

THE D.H.93, which followed the D.H.92, is in course of full production. Known as the Don Trainer, it is a low-wing monoplane fitted with retractable undercarriage and every other modern device, a special feature being its rotating gun turret.

The Albatross, with a range of 1,000 miles, offers the operating companies a useful payload of 4,200 lb. ; this includes accommodation for twenty-three passengers, and allows for a crew of four. Such a machine is too big for the smaller services, and so the D.H.95 has been designed on similar but smaller lines. The idea behind it was to produce a fast machine with a high safety factor, particularly with regard to take-off and climb. It is a high-wing monoplane, with retractable undercarriage.

The D.H.95 represents an important event in the history of the De Havilland Company. It is the first machine of the long line to be built entirely of metal. Anticipating the findings of the Cadman Committee, the designers realized that with increased subsidies there would be a much bigger market for a medium-sized high-speed machine. Moreover, as it is cheaper to build entirely of metal—in quantities—the D.H.95 was planned accordingly. Two Bristol engines were chosen, because to adapt the design to Gipsy engines would have meant building the machine either larger or smaller.

It took the De Havilland Company ten years to develop its in-line type of engine to its present superb performance, and at least two or three years were needed to evolve the latest Gipsy Twelve, which, after all, is but a double Gipsy Six. It would, therefore, have taken years to develop an entirely new engine of the required power.

Thus, thirty years after his first experiments, de Havilland continues to work hard for the improvement of flying—to which he pinned his faith at the beginning. Few men have done so much for aviation.



TO PREVENT THE DEVELOPMENT OF FAULTS IN EARLY SOLO FLYING the pupil receives a short spell of dual instruction each day before flying by himself. The instructor will then deal with any points in the pupil's flying which require further comment. In this picture an instructor at Brooklands Flying Club is emphasizing that the pupil can verify by means of his bubble cross level whether he is using the correct amount of bank in a turn.

LEARNING TO FLY—4

PROGRESS TO SOLO FLYING

Spinning, the First Solo, Forced Landings and Tests for the "A" Licence

WHILE a pupil carries out circuits of the aerodrome, each one ending in a landing, the instructor will keep a close watch on all the details of the pupil's flying. The instructor will thus be able to correct any tendency to form bad habits in flying. Although at first the pupil will make numerous poor landings, he will, however, find himself occasionally making a good one. Soon the frequency of good landings will increase, and even the poor landings will be safe ones. At this stage the pupil is nearing his first solo flight—probably a pilot's most memorable experience.

Before he is sent up for his first solo flight, the pupil may, or may not, be taught spinning. This is a matter that is mainly dependent on the type of machine on which he has received his instruction. If the machine is one that will not spin, or which is not intended to be spun, obviously, spinning will not find a place in tuition. But most aircraft designed to be used for training can be spun. It is an essential requirement for the training of R.A.F. pilots.

There are definite advantages to a pupil in learning to spin before going solo. He is not likely, however, to get into an unintentional spin on his first solo flight. Learning to spin will sharpen the pupil's perception of an incipient stall, and will enable him to apply the correct remedies immediately and before any harm is done. A knowledge of spinning will remove any fear the pupil might have of the manoeuvre, and will therefore increase his confidncee in himself.

Spinning for the first time as a passenger may be rather impressive, or thrilling, but any antipathy to the unusual movement generally disappears once the pupil has performed one or two spins himself.

For a lesson on spinning the instructor will first tell the pupil to climb the aeroplane to about 3,000 feet. The instructor will then demonstrate a spin. Plenty of height is needed because height is rapidly lost in a spin and during the dive which always follows the correction of the spin.

A spin may be started in many ways. The conditions required to start a spin are that the aeroplane is stalled and that a turning tendency in the yawing direction is present. This turning tendency is generally supplied by the rudder, but on some aircraft it may be provided by the aileron drag when the stick is put over to one side. To demonstrate a spin the instructor will use the following procedure. First the throttle is closed ; then the nose of the aeroplane is gradually raised by