DE HAVILLAND TO-DAY

September, 1944

1d.

After five years of war the de Havilland enterprise is to-day almost fully extended in its effort, though Mosquito production in Australia has yet to build up for the coming Pacific campaign, and some further surprises are being prepared for our enemies.

This booklet briefly explains the present scope of the organisation so far as the censor will allow, and includes by way of background an outline of de Havilland history.

DE HAVILLAND TO-DAY

THE DE HAVILLAND enterprise consists of a parent company and affiliated concerns in England and a group of associated companies in the Dominions. When we used to speak of " the de Havilland family " before the war we included also our many agencies in the Colonies and foreign countries (indicated by dots on the front-cover map), for close bonds united us.

Our main interest is aircraft design and manufacture. Because of the paramount importance of the power installation we developed our own engines for the small and medium-sized aircraft which were our chief concern. And when variable-pitch propellers started to become a specialised branch of the industry we pioneered their production in this country and it grew to be a major division of our business.

Before the war our Dominion companies were principally marketing and servicing organisations. Now those in Australia and Canada are builders of D.H. aircraft, in a big way, and our New Zealand company also manufactures complete machines in quantity.

Our associated undertakings in England include the Airspeed company, the de Havilland Forge, the de Havilland School of Flying, the de Havilland Aeronautical Technical School, and one or two smaller interests.

We have consistently given servicing the important place it should occupy alongside aircraft design and manufacture, so that to-day we operate and supervise

big overhaul and repair organisations for all our products, as well as for some products of other companies like Spitfire aircraft and Merlin engines.

Before the war our home establishment comprised the aircraft factory at Hatfield, the engine and propeller factories at Stag Lane, Edgware, a propeller shadow factory at Bolton, the Flying School and the Technical School. To-day, because of the suitability of all our products and our ability to expand without loss of cohesion, we find ourselves controlling nearly a hundred factories and premises, large and small, in this country alone.

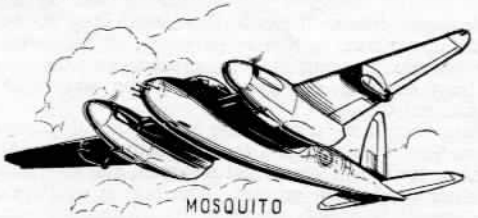
We have always been the leading builders of transport and training aircraft in the British Empire. To-day we are also in the forefront of achievement on the military side, and possess one of the most comprehensive and strongest technical organisations in the British aircraft industry. Furthermore, we are the only first-class creative enterprise that has full-scale aircraft manufacturing establishments in three continents —a world-wide dispersal system. For all that, we are still a relatively small concern with a peculiarly compact and homogeneous character, and we hope that this will help us to negotiate the difficult adjustments to post-war conditions, whatever they may be.

We will now briefly outline the enterprise as it is in 1944, without telling the enemy anything that he does not already know and without giving him anything but discomfort.

AIRCRAFT PRODUCTION

The three de Havilland aircraft types that are in full production at present are :

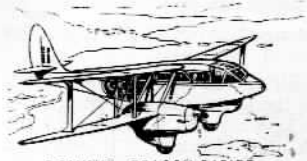
The Mosquito : the fastest aircraft of its day in the world, the most versatile and one of the most successful aircraft in the war, unique in being made of wood. It is built by the thousand in Britain, Canada and Australia. As everyone knows, it has Rolls-Royce engines.


MOSQUITO

The Tiger Moth : for several years the principal basic trainer of the Royal Air Force and the Dominion and Colonial Air Forces. Practically every pilot in the British Empire has had his initial flying instruction on this machine. Its production is reckoned by the ten thousand. It has been built in Britain, Canada, Australia, New Zealand and some foreign countries and has had a long career, having been designed in 1932. It has the de Havilland Gipsy Major engine.


TIGER MOTH

The Dragon Rapide or Dominie : a light transport in world-wide use before the war, popular because of its low first cost and operating cost,



DOMINIE DRAGON RAPIDE

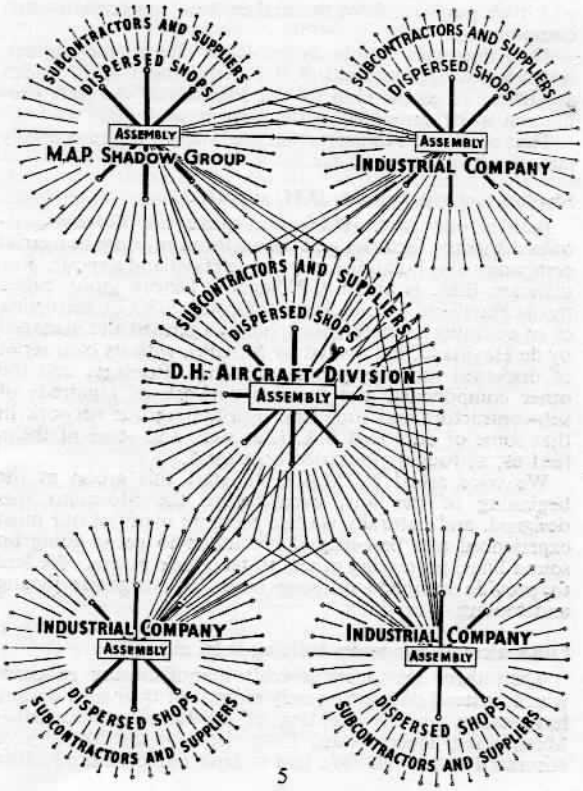
all-round practical utility and reliability and extreme ease of repair and maintenance. It has continued in production during the war (with the R.A.F. name Dominie) as a flying classroom for navigational training and as a communications vehicle. It has de Havilland Gipsy Six engines, called Gipsyqueens in R.A.F. language. It has never been built outside England but its predecessor, the Dragon, has been made in Australia during the war, also as a navigational trainer.

These aircraft are made under such widely dispersed conditions that it will be best to start with our own Aircraft Division, see how it works and is served, and then deal with the other production groups. The partial overlapping of these groups is crudely sketched out on the opposite page and will be referred to below.

The Aircraft Division :

This is a group of large and small factories and shops dispersed from 1940 onwards to reduce invasion and bombing dangers. Many parts of the aircraft we build are fabricated in these various shops, but others come from M.A.P. shadow factories, or from sub-contractors of whom we have trained over 400 to work for us under our technical guidance. The adaptability of these industrial concerns, most of them small firms with all the keen conscientiousness of private enterprise, has been an eye-opener. Little factories that made chairs and wardrobes, bicycles and window frames, learned to work to aeronautical precision and at an unaccustomed pace that often involved them in extensions and dispersals of their own.

Also, there are " bought-out " items like wheels and tyres



which we purchase from the makers who specialise in such components.

Then there are "embodiment-loan" items like engines, instruments, standardised R.A.F. equipment, etc., which are issued to us on loan by the Ministry of Aircraft Production to be embodied in the aircraft we build.

Thus parts and sub-assemblies are brought to the assembly factories from near and far.

Shadow factories building D.H. aircraft :

Besides our Aircraft Division there are Government-owned shadow factories and the factories of other industrial companies also building complete de Havilland aircraft. For instance, there is an M.A.P. shadow factory group called the de Havilland Second Aircraft Group (S.A.G.), consisting of an assembly depot (planned, built, organised and managed by de Havilland, but owned by M.A.P.), with its own series of dispersed factories producing wings, fuselages and the other components, and its own network of hundreds of sub-contractors and suppliers, overlapping our network in that some of ours feed S.A.G. as well, and some of theirs feed us, as roughly indicated on page 5.

We were asked by M.A.P. to start this group at the beginning of the war, even before the Mosquito was designed, and naturally we had to spare many of our most experienced and best-trusted executives to get it going on sound lines, promoting others to take their places. We had to provide complete drawings and data, organise jigging and tooling, everything.

Other aircraft companies building D.H. aircraft :

Then there are other aircraft manufacturing concerns which, instead of building only aircraft of their own design, have taken on the building of de Havilland aircraft—Mosquitoes, Tiger Moths, Dominies—for the Ministry of Aircraft Production. We had to lend our own production

engineers and organisers to these concerns and supply them with tens of thousands of drawings and all instructional data, and often jigs and tools as well, and generally to get them into the way of an unfamiliar job and make sure they could do it properly, and introduce them to sub-contractors and so help each of them to build up a network of satisfactory suppliers, again partly overlapping our own network. This has made a further drain on our best personnel, continuing all through the war as first one company and then another was asked by M.A.P. to take up the manufacture of the Mosquito and our other machines.

Companies in other industries building D.H. aircraft :

Furthermore, outside the aircraft industry there are motor-car manufacturers and others who with plucky adaptability have turned over to making Mosquitoes. Tiger Moths and Dominies. Their problems were rather greater for they were quite unused to aeroplanes and to the very close manufacturing limits, rigid inspection and special procedure that have necessarily become traditional in our industry. We have had to lend engineers and give very liberal guidance and continuous close liaison to such companies, and they have done remarkably well. They likewise have had to organise with our help their systems of sub-contracting companies and other suppliers.

Overseas D.H. factories building D.H. aircraft :
Canada.

Apart from foreign state factories like those in Portugal and Persia which build Tiger Moths, the only concerns overseas that are building complete aircraft of our design are de Havilland companies, though, of course, hundreds of sub-contractors supply them with parts, including large units like wings and fuselages.

The back history of our overseas companies will be touched on in a separate chapter, but the first real quantity production by de Havillands overseas was when our

CANADA

Canadian Company late in 1937 began building, to Hatfield drawings which they adapted here and there, a special " arctic " version of the Tiger Moth with coupé top, wheel brakes, and so forth. They built thousands onward into the war period and took on Ansons as well, and then in September, 1941, they turned over, lock, stock and barrel, to Mosquitoes.

The help we had to give from England can be well imagined, and many of us worked so hard on the job we have no need to call on the imagination. Complete wing and fuselage jigs, smaller jigs and fixtures, simple components and aircraft, tools, tens of thousands of drawings (all copied onto micro film), operation and materials schedules, hundreds of special photographs, supplies of the parts they could not easily get made over there, senior engineers on long-term loan—a full-size job in every way. Getting a motor-car manufacturer at home into Mosquito production really cannot be compared with it. Many a freezing-cold flight across the Atlantic at night in cramped bomber fuselage with a thermos and an oxygen mask was made by men who had reached their senior positions in twenty years of devoted " apprenticeship " to de Havilland aircraft designs and methods. Their loss in the ocean would have been serious for the industry. But we did not lose men, and we did not lose supplies or even drawings except for an occasional batch.

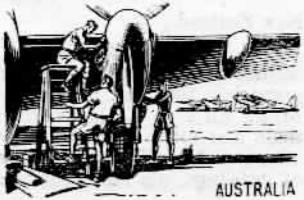
Canadian and American industrial companies showed adaptability as English firms had done. General Motors turned over from motor chassis to balsa-sandwich fuselages, Massey Harris from corn harvesters to plywood wings, Nash Kelvinator from refrigerators to variable-pitch propellers.

The American Packard Motorcar Company were already under way making the Merlin engine to Rolls-Royce design and de Havilland Toronto soon became a big " customer " of theirs.

Australia.

Our Australian Company started building Tiger Moths at the end of 1938. They had engineers training at Hatfield well before that, and directly war broke out their Tiger programme was greatly enlarged. They received the customary help from Hatfield, took thousands of drawings, hundreds of sets of parts in finished, half-finished and raw state. Some of these were sunk by submarines, but not many. Their production became more and more independent of England for supplies. They have made Tigers by the thousand.

In the first few weeks of war they arranged for the Tiger Moth engine, the de Havilland Gipsy Major, to be built in Australia by General Motors (Holdens), Ltd. All the drawings for the 700-odd components had gone out previously from Stag Lane but every measurement and tolerance had to be converted from the metric to the inch system. Engineers took out masses of technical information and production technique—much of this in their heads—and goodwill as well to lubricate the machinery. Everything was made in Australia except magnetos, carburettors and ball bearings, the first engine passed its tests in August, 1940, and soon production was in full swing.



AUSTRALIA

Then the Australian Air Force needed a navigational trainer like the Dominie but did not want to have to import the

engines. Again the home company's print room had to get to work—this time on the thousands of drawings of the Dragon, a 1932 transport design admirably suited to the job, and we sent a lot of original tools from store as well as supplies of bar, forgings, castings and tube. The Australian-built Gipsy Majors went into the machine satisfactorily and it was an all-round success.

Directly the Japs abandoned their lie and attacked Pearl Harbour on December 7, 1941, our Australian Company plumped for building Mosquitoes. From England we repeated the liaison we had organised to the Canadian Company, but at four times the distance. The Australian project started and has so far run about nine months after the Canadian. This experience, which would never have been attempted in the cautious days of peace, is having a tremendously strengthening and maturing influence upon our two main Dominion Companies.

In 1939–40, foreseeing the need, our Australian Company, with full help from Stag Lane, had started up an entirely new division for the manufacture of variable-pitch propellers. This is the only factory of its kind in the Southern Hemisphere, strategically of the utmost value in the war with Japan though initiated two years before we knew which way the Jap would jump. It has grown with all possible speed and now constitutes one of the major steps towards Australasian self-sufficiency in aircraft supply.

New Zealand :

Our New Zealand Company is the youngest of them all, formed early in 1939 when the Air Ministry was urgently preparing for war. The purpose was to build Tiger Moths for New Zealand Air Force training and to service these and other aircraft. Previously an agent had looked after our New Zealand interests. Out went the thousands of drawings, the administrative staff, the supplies, first of

parts and later just raw materials. Up went the factory and out poured the straightforawrd little Tiger Moths. That production, and other work, has continued steadily since.

NEW ZEALAND

India.

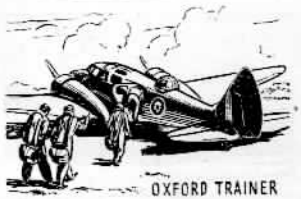
Our Indian branch does not build complete aircraft but quickly developed the making of components when the need arose and so is contributing usefully to the Indian effort. Its part will gather importance when the drive eastward begins.

Africa.

Our South African and Rhodesian companies, both engaged in aircraft servicing and flying instruction, were taken over by the authorities when the war began, ready-made units of expert men that were usefully absorbed into the air plans of these Dominions.

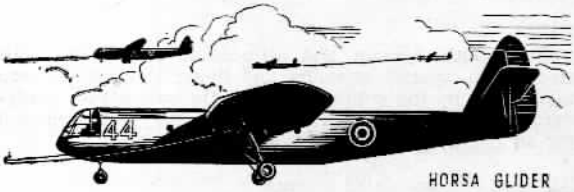
Airspeed—an associated company :

To round off the de Havilland interests in aircraft manufacture we must name Airspeed Ltd., a well-established designing and producing company with its pre-war centre at Portsmouth and wooden commercial aircraft as its main interest. It became an associated de Havilland company in 1940 and so is part of the family. The Airspeed Oxford is the principal twin-engine trainer of the British and Empire Air Forces and has been needed in far greater numbers than any one factory could produce. The Airspeed Horsa glider, designed early in the war when its use in numbers for offensive action appeared more in the nature of a dream, has proved an equally sure success. Both these craft,



OXFORD TRAINER

therefore, are made by the thousand by Airspeeds, by shadow factories and by other industrial companies, with networks of sub-contractors serving them. Our own Aircraft Division made hundreds of Airspeed Oxfords early in the war and that work (along with Tiger Moth and Dominie manufacture) was only pushed out of our shops to make room for the Mosquito.



HORSA GLIDER

AIRCRAFT REPAIR AND OVERHAUL

We have so far reviewed our aircraft production responsibilities, digressing a little onto engines and propellers only in order to complete, while we were at it, the picture of our Australian activities. We will now explain our aircraft servicing organisation (home and overseas) before dealing with our other main production and repair interests—engines and propellers.

The Air Ministry and M.A.P. have a wise system of appointing the parent company of each product to be to a large degree responsible for its servicing and repair, to work out maintenance methods and organise facilities in conjunction with the Royal Air Force.

Mosquito :

Thus it was we in the early days who weighed up the crash expectations, repair capacity and spares needs for the Mosquito in accordance with the aircraft delivery programme and operational outlook, and it was we who located premises and organised the first repair bases.

The centre of this great task, and the first of the bases, is our own Mosquito Repair Organisation. Instead of enlarging this to an unwieldy size and so having all our sitting Mosquitoes in one basket we sought out other engineering facilities, partly industrial and partly within the R.A.F., and developed a dispersed repair organisation. All seriously damaged Mosquitoes are notified to us and apportioned with our concurrence to our own or

MOSQUITO REPAIR

the other depots to repair. We guide the other depots on all repair methods and equipment. We send engineers with mobile workshops to mend aircraft where they crash. We have liaison engineers attached to the R.A.F., Dominion, American, Polish and other squadrons in the field, many at home, others overseas as far away as Burma, who look after their maintenance problems. They are kept up to date with technical bulletins and frequent visits home. We fly engineers to the squadrons to advise on servicing and repairs and to design repair schemes on the spot. We run a school to teach R.A.F. and other engineers how to maintain Mosquitoes and get the best out of them.

Our Canadian, Australian and Indian Companies assist the Service units in their own territories in similar fashion, and their effort will grow as the Pacific war warms up.

Dominie, Tiger Moth and other D.H. Types :

We have corresponding responsibilities with regard to Dominie, Tiger Moth and miscellaneous D.H. aircraft types, though they are implemented differently in different parts of the world. In the first weeks of the war we found and organised an aerodrome and then other premises (previously woollen mills and glove factories) into an Aircraft Repair Group, in Oxfordshire, which became the central repair base for all D.H. types except the Mosquito.


D.H. AIRCRAFT REPAIR

For standard machines like Tiger Moths and Dominies a lot of the actual work is done at R.A.F. Maintenance Units, and years of practice have made them a matter of routine. All the same, our Service Department exchange

visits, watch the behaviour and overhaul experience of our aircraft, send technical bulletins, analyse reports from home and overseas units, keep an eye on spares provisioning. We send out working parties for special repairs, and have flown parties as far as North Africa and Iceland on urgent assignments.

Our Canadian, Australian, New Zealand and Indian companies service the user on much the same basis, each manufacturing all or some of the parts required as spares for these unwarlike but necessary and prolific aeroplanes.

It must be remembered that commercial air transport operators in Britain, Canada, South America, free European countries, Africa, Asia and Australasia continue to need our servicing aids and spares supplies to maintain their regular flying through the war years, which in most cases is necessary to the Allied war effort, so that we still maintain some non-military contacts. Mosquito " air liners " of British Airways are a case in point, and " civilised " Dominies have been supplied to home operators, to the Middle East, to Rhodesia, even to Iceland, all for public transport.

Our New Zealand Company has made an additional speciality of servicing Airspeed Oxford trainers, and making major components for them.

Hurricane and Spitfire :

In the bad days of 1940 we and other firms were asked to help the R.A.F. to maintain fighting strength on their pitifully small stocks of aircraft. We took on the repair of Hurricanes, transferred the job later to our Oxfordshire base, developed it to considerable proportions, were asked to double the work by taking on Spitfires as well, and agreed. The


SPITFIRE REPAIR

Hurricane work naturally tailed off as the type obsolesced. The Spitfire repairs remain high in priority.

Engine and propeller servicing will be dealt with under their respective chapters.

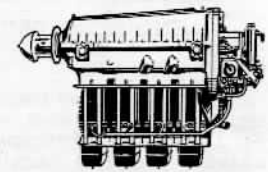
ENGINE PRODUCTION

How our Engine Division began as a small department in 1927 and steadily grew up is described in the historical chapter. We now have a separate engine company. On the production side our first responsibility, from the start of R.A.F. expansion in 1936 and earlier, has been to provide the power unit behind which every pilot in the R.A.F. learned to fly. Stag Lane tradition comes in here—that curious mixture of engineering exactitude, London pride and home-of-the-old-firm humour that clings about the portals and capstans of the historic place.

The inborn confidence of the youngsters entering the Air Force could never be truly nurtured through their training and on to the careers of combat flying in fast aircraft if they or their instructors ever harboured the slightest misgiving about the quality and reliability of the engine on which their young lives depend in these impressionable months when they are learning to fly. That being so, it is something to have gained the faith of the authorities from the earliest days of our engine business, and to have held it right through the phenomenal years when virtually the cream of British manhood has taken wings. Practically every one of these men took his lessons and flew himself off solo and did his first cross-country and his first aerobatics with one hand at the throttle of a Gipsy Major engine made by the Stag Lane team, or perhaps by Australian workers with a Stag Lane element among them. The affection of these legions for the Gipsy engine is unanimous to a man.

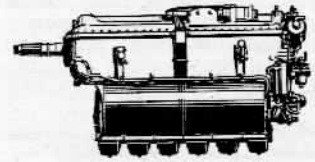
GIPSY ENGINES

Tens of thousands of Gipsy Majors have been made. By the time this is printed their official overhaul period will probably have been extended to 1,500 hours, equivalent to six flights round the Equator.



GIPSY MAJOR ENGINE

The only other Gipsy in continuous production through the war has been the Gipsy Six or Gipsyqueen in its two main versions, for fixed-pitch and variable-pitch propellers. These are wanted for Dominies and Proctors, both navigational trainers. Gipsies of the present range are too small for operational aircraft except that the little Auster III artillery spotter purrs about the battle fronts in contented confidence powered by the Gipsy Major.



GIPSY SIX II. ENGINE

Much engine production can be accomplished by an organisation of quite moderate size, so that we have never had to develop a shadow production of Gipsies. Dispersal and the subcontracting of detail fabrication have looked after the enemy-action risk.

On the experimental and development side we have some interesting work in hand with which many members of the organisation are familiar. The new version of the supercharged Gipsyqueen, although somewhat publicised of late, is not the only novelty. The work occupies a number of designing, machining and assembling departments, ground and flight testing units and laboratories, all wisely dispersed.

ENGINE REPAIR AND OVERHAUL

Gipsy Engines :

Even at a thousand hours between overhauls (and that is what Gipsy Majors have been *averaging*) a Commonwealth Air Training Plan that runs into millions of hours calls for a broadly conceived overhaul organisation. Methods, however, must have strict uniformity, inspection standards must be universally rigid, statistics of wear and behaviour must be gathered and collated. Our Engine Service Department and Inspection Department in England already had a sound working understanding with and technical supervision of de Havilland servicing in Australia, Canada, India, South Africa and New Zealand, carefully cultivated over the peacetime years. It remained to expand the system, preserving the methods. We secured first of all the services of a number of engineering concerns in England, which with a feminine touch we have for five years been referring to as " the daughter firms." We loaned them Gipsy experts, showed them our routine, our handling gear, taught them our dimensional tolerances and condition limits, the little signs by which we know the state of a Gipsy stripped down after 120 million turns of the crankshaft.

We looked into the training programme, worked out the graph of the overhauling capacity needed, organised the parcelling out of the engines pouring in from the schools, provisioned the spares to suit, fixed up for periodical visits to and from the parent D.H. repair department. In practice the technical control has proved satisfactory and it has been achieved without so much spreading of D.H. technicians as might have been expected. This system has worked well. We are the hub of it.

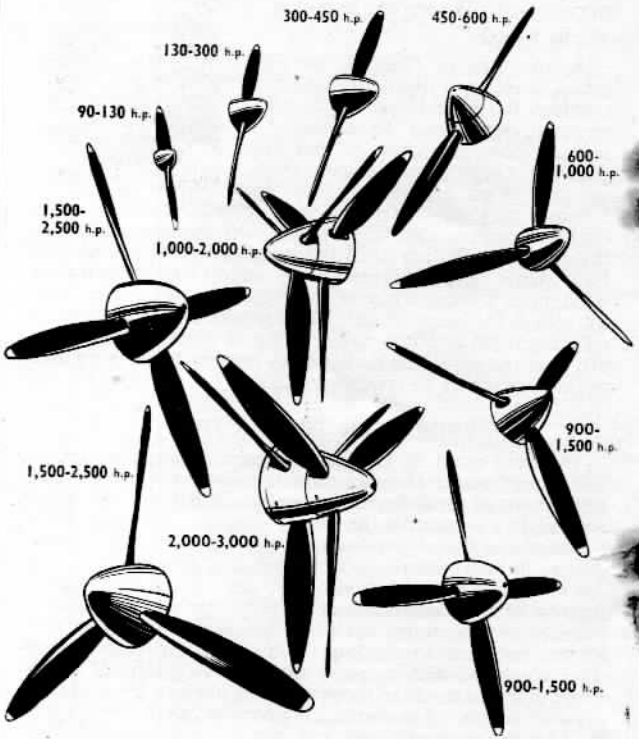
Merlin Engines :

At the time of Dunkirk we were asked to set up a depot to repair and overhaul the Rolls-Royce engines that powered our fighter squadrons. It seemed more important at that time than any Gipsy overhaul scheme and we took it on immediately. So the Summer of 1940 saw us overhauling both Hurricanes and their engines—the prime material for the defence of Britain when she stood alone. We developed this Merlin Repair Department, under the Rolls-Royce wing, until it became one of the biggest in the country, and we believe the most efficient. Its capacity has grown out of all recognition and it is now a group of dispersed premises. We have outgrown the drain of key men by training up and promoting others to take their places.

PROPELLER PRODUCTION

The third main de Havilland interest is propeller design and manufacture. How we came to pioneer the commercial production of variable-pitch propellers in Britain from 1934 onward is a matter for the history chapter. Although 1939 found us the biggest producers in the world, with a shadow factory in Lancashire built as the result of timely precaution on the part of the Air Ministry, our output was but a fraction of what was required of us for the war programme —and that programme has been increased in stages so that its first issue looks ridiculous to-day. Our early expansions were combined with war-risk dispersal. Groups of blade shops and hub machine shops took the place of the compact pre-war set-up. The Northern Propeller Division (owned by M.A.P., planned, built and run by us) expanded and

THE RANGE OF DE HAVILLAND PROPELLERS



scattered in the same way. Laundry premises, cotton mills, bedding factories were requisitioned, all turned into production shops under our own management. Spreading of the supervision staff and key craftsmen out its unavoidable strain on the whole organisation.

Later programme expansions required us to invoke the aid of other engineering concerns of high repute who were not so busy as we, and a situation arose comparable to that in Mosquito production.

This great network of roaring machine shops, blade shaping and scurfing shops, processing and assembly departments, producing tens of thousands of propellers and constant-speed units of all shapes and sizes for engines from the 200 h.p. Gipsyqueen to the 2,200 h.p. Napier Sabre, and bigger, is held in balanced output from our production control office, itself sensitive to the changing requirements which are imposed upon M.A.P. by the development race of the individual British and American aircraft constructors.

Fortunate it is that the bulk of our delivery is of the same basic design as that pouring out from the Hamilton plants in U.S.A. Indeed, there is a considerable interchangeability which permits, for instance, British blades to go into certain American hubs, and a general uniformity of maintenance routine also results.

We make something like a half of all the propellers of the R.A.F. It is nothing for three thousand de Havilland propellers to be over Germany at one time, pulling along twenty thousand tons of British bomber craft with a load of over two thousand tons of high explosive.

Our propeller design department keeps pace

with continuous improvement in the aircraft by new blade shapes, more compact hubs, by using more blades and by double propellers with counter rotation. Every new aircraft development means a new propeller installation, and it may be of small or large size, for radial or in-line engine, for fighter or bomber speed—the whole field is served. The onerous responsibility of maintaining a lead over the enemy is thus borne in part by the propeller designers of this company.

The very first constant-speed propellers to go into combat service were propellers of de Havilland make, and they took part in the earliest bombing attacks made by the Royal Air Force almost immediately war was declared in September, 1939. In the struggle for superior aircraft performance which our designers and enemy technicians have unremittingly waged the propeller has played a most important part. An outstanding problem has been that of converting efficiently into thrust the powers which the great modern engines deliver, and at the altitudes at which they are required to operate. There is cause for satisfaction in the fact that our propeller designers have kept ahead all along, not only in aerodynamic efficiency but also in mechanical serviceability and repairability. Our propellers are unsurpassed in the world of aeronautics.

The conversion of 1,050 Hurricanes and Spitfires—the main body of our home-defence squadrons—from two-pitch to constant-speed propeller actuation, which we accomplished in 52 days before the Battle of Britain, and which may well have affected its issue, is an epic that has been told elsewhere.

PROPELLER REPAIR AND OVERHAUL

The ease of repair of the ductile aluminium-alloy blade had been exploited before the war. The blades naturally take most of the shock in any crash. As they can be depended upon to bend back gracefully (incidentally acting as

skis and saving many an aircraft and crew from destruction), it follows that the strain imparted to the hub mechanism and the engine is limited. We quickly developed the technique of straightening and repolishing the blades—with heat treatment in bad cases—and this has been literally a godsend to the propeller supply situation throughout the war. Hub and constant-speed-unit overhauls and repairs became a straight routine as well.

Almost overnight in the Summer of 1940 many hundreds of propellers poured into our premises for repair, and our programme for expanding the repair capacity was at once stepped up.

It is a long and interesting story, the outcome of which is that we now operate a dispersed system of civil repair units and supervise the methods, work flow and spares provisioning of a number of other units, which together have such a huge capacity that at times the return of repaired propellers into service has exceeded the total output of new propellers.

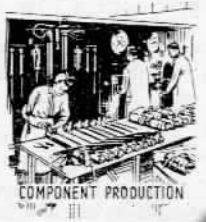
In the first two years of war it was found that 80 per cent. of the blades in damaged de Havilland propellers could be repaired; even now—despite higher landing speeds, abrasive runways and other bad influences—the proportion is 66 per cent.

Our Propeller Service Department keeps a close eye on healthy as well as injured propellers, has engineers all over the country and in France with the R.A.F. and makes periodical tours of squadrons and repair units overseas. Our installation engineers also look after the propeller problems of the aircraft and engine builders.

THE DE HAVILLAND FORGE

In February, 1942, we formed a separate company, The de Havilland Forge, Ltd., to increase the supply of light-alloy forgings for propeller blades and hubs and for other needs. Collaborating closely with the Government and with other industrialists we planned, built and organised a production unit in this heavy industry which is so different from and yet so essential to aircraft manufacture. Another drain of key executives was faced and survived, the project succeeded and now ten of thousands of propeller blade and other forgings flow to our fabricating shops from our own forge hammers.


FORGE


COMPONENT PRODUCTION

COMPONENT MANUFACTURE

Specialised demands in high-performance aeroplanes, and the convenience of directly controlling manufacture, have led our company to undertake the design and production of certain components which aircraft builders in the general way buy ready-made. For example, the undercarriage units and hydraulic jacks on the Mosquito are our own design and manufacture. The demands for special components must vary between different aircraft that we may be engaged upon but are likely to persist in one form or another, and we are for that reason associated with a company called Hearle-Whitley Engineering, Ltd., which concentrates on component manufacture.

RESEARCH

A separate mention must be made of research work that is undertaken by de Havilland laboratories extending beyond the normal scope of our developments in aircraft and propulsion-unit design. Here we are in a little difficulty to be explicit on account of the censor but a passing reference may be made to the search for new materials and structure forms, and we can be a trifle less secretive about our advanced technique in the electro-dynamical measurement of vibration, which has served the aircraft industry in general and other industries as well, so that the work has taken on a national significance and application. It was because propellers were sometimes blamed for aircraft vibrations which arose from resonance and could be prevented elsewhere in the airframe that this exact technique was evolved, entailing the deliberate excitation of vibrations to desired frequencies and the photographic recording of local and general vibrations, not only of structures and mechanisms on the ground but even of aircraft in flight, trains at speed, power stations, ships at sea, and so forth. The de Havilland research unit has contributed usefully to the whole study.


ELECTRO-DYNAMICAL RESEARCH

FLYING TRAINING

Besides all our main activities on the manufacturing side we have always been closely concerned in flying training, regarding not only the design of trainer aircraft but also the fine points of training technique as our very special interest. We started the first school of flying for the R.A.F. Reserve at Stag Lane in 1923. With the expansion in 1936 onward we opened a second school at Maidenhead, later

taken over for another purpose. Hundreds of schools were later opened by the authorities to meet the Empire programme, with the Tiger Moth as their primary aircraft, but to this day the original school, No. I Elementary Flying Training School of the R.A.F., is operated by the de Havilland Company, a military establishment under civil administration.

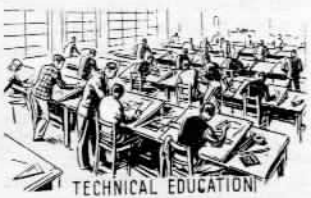
Our overseas companies likewise have always been close to the trianing side, in some cases running their own schools, in others associated with local schools, but always maintaining the recognised British standards in method and equipment. This is perhaps the prime reason why it is generally felt that de Havillands of all aircraft firms in the world should be able to create the next generation of trainer aeroplanes when the Tiger Moth is honourably pensioned off.


FLYING TRAINING

TECHNICAL EDUCATION

The national and governmental consciousness is awakening to the fact that technical education in our industry must be developed if the British are to hold a high place in world trade and culture after the present trouble is over. This new public tendency supports an opinion to which we gave voice in 1928 when we inaugurated the de Havilland Aeronautical Training School. A scheme of apprenticeship also was started in those early years. Both have developed and latterly they have become merged, with a system of scholarships that seeks to open the way for any young D.H. employee to receive the full technical education necessary to qualify him as an aeronautical engineer, specialising in

one branch or the other according to his aptitude. To provide the opportunity to learn is, we feel, the way to produce strength, leadership and a satisfying sense of participation in this industry of ours that has to play such a big part in the relationships of the world from now onward. It is a policy that takes patient and detailed working to fulfil, but we have given ourselves a good start and our principles and groundwork are all well established.


TECHNICAL EDUCATION

The organisation of the training scheme has been given detailed attention in other literature and more will be heard of it.

* * *

In addition to all the projects and activities outlined in this little book much that is of great interest and significance has been left unmentioned for reasons of secrecy. Our policy has been to further the main cause to the limit of our capacity, regardless of every other consideration. The expansion which this has brought about has been rendered possible by the experience and character of the supervision staff and by the ability and conscientiousness forthcoming from among our people in all the numerous branches of our Empire-wide enterprise.

THE BACKGROUND

The de Havilland Aircraft Co., Ltd., came into being on September 25, 1920. Fourteen men and one woman still with us in 1944 were among the fifty or sixty individuals who 24 years previously moved into a couple of sheds and a wooden office hut which formed the original home of the company on Stag Lane Aerodrome. Edgware. That old hut, brought from Stag Lane a few years ago, is still in use as an office building in the Aircraft Division.

The men who got the company going in a humble way in 1920 have guided its development throughout the subsequent years and are its active leaders to-day. They are Sir Geoffrey de Havilland, Mr. F. T. Hearle, Mr. C. C. Walker, Mr. W. E. Nixon and Mr. F. E. N. St. Barbe. Mr. A. S. Butler, a keen airman, joined the company as a director in 1921, and has been Chairman since 1922.

At the end of each year since our twentieth birthday in 1940 a gathering has been held of those who have served the company for an unbroken spell of twenty years. Many of these veterans had been working together before 1920 at the Hendon factory of the Aircraft Manufacturing Co., Ltd., of which Sir Geoffrey (then Captain de Havilland) was Chief Designer during the last war. In all we have with us to-day 32 twenty-year employees who were previously at "Airco."

Mr. Hearle joined the Captain very much earlier still, in 1908, and helped to build his first aeroplane. This historic machine had a four-cylinder, horizontally-opposed, water-cooled engine of de Havilland's own design, driving through bevel gearing two propellers of which the aluminium blades were

STAG LANE 1920

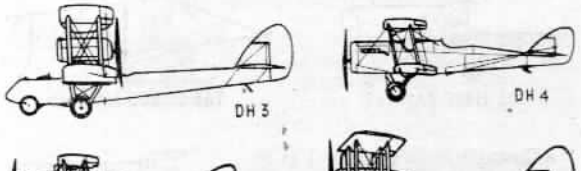
THE FIRST MACHINE

THE SECOND MACHINE

" adjustable as to pitch and as to twist." On its first flight it came to grief, but luckily de Havilland was not hurt, neither was his ardour dampened, and the two men at once set about constructing an improved aeroplane on which de Havilland successfully taught himself to fly.

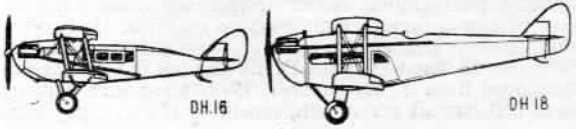
DH I

When their little money was nearly all gone and it looked like a return to motor-car engineering, they both were offered positions at the Government Balloon Factory at Farnborough, and the " de Havilland No. 2 " was purchased as well. That was in 1910. At Farnborough de Havilland was mainly responsible for the design of a military canard-type pusher biplane, and of the better-known B.E. series of tractor biplanes for the Army. Early in 1914 he joined Mr. Holt Thomas's firm, the Aircraft Manufacturing Co., Ltd., at Hendon, as Chief Designer. Before war broke out with Germany in August that year he was well on with the design of the D.H.1 two-seat pusher biplane fighter, and he followed it with the single-seat D.H.2, a twin-engined D.H.3 bomber prototype and, in August, 1916, the tractor biplane (D.H.4) which, first appearing as a bomber with fighter performance (as did the Mosquito 24 years later), was developed also for fighting, photographic reconnaissance and other functions and became a famous multi-purpose machine. It is often said that no aircraft did so much towards the defeat of Germany in that war as the D.H.4 and the D.H.9 that was developed from it. By October, 1918, Airco were building over 250 aircraft per month, mostly D.H.9's. They were



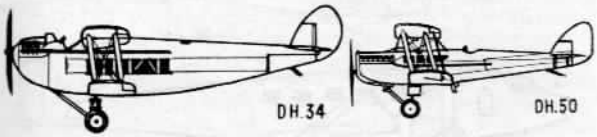
just going on to the D.H.10, developed from the D.H.3 for the purpose of bombing German industries, when the war came to an end. A third of the total Allied air forces (and 95 per cent. of all the American production for that war) were aircraft of de Havilland design.

Official cross-Channel air services, and later public air lines, were run with D.H.4's and 4A's and 16's (adaptations of the war-time D.H.4's and 9's) but they were lean times for aviation and in 1920 when Capt. de Havilland and Mr. Walker were designing the D.H.18, an 8-seater cabin machine which was the first proper attempt at a transport aeroplane, the Airco concern decided to close down their Aviation Department. Unable to believe that there could be no future in civil flying, Capt. de Havilland and his colleagues managed to form a little company on their own, again with Mr. Holt Thomas's help, and from that our world-wide organisation has grown.



In the office hut at Stag Lane the " Design Department " (comprising Capt. de Havilland and Mr. Walker) occupied a small room on the left of the entrance. On the right was a little office from which Mr. Hearle controlled production —though the only job on hand at first was an order from the Ministry to finish off a couple of D.H.18's that had been started by Airco. Next to Mr. Hearle's office was a small room which Mr. St. Barbe, the Business Manager, shared with Mr. Nixon, the Secretary.

To-day, Sir Geoffrey de Havilland and Mr. Walker, as Technical Director and Chief Engineer of the Aircraft Company, have charge of all design and technical matters, Mr. Hearle is the Managing Director, Mr. Nixon, Secretary and Director, and Mr. St. Barbe, Business Director. Of

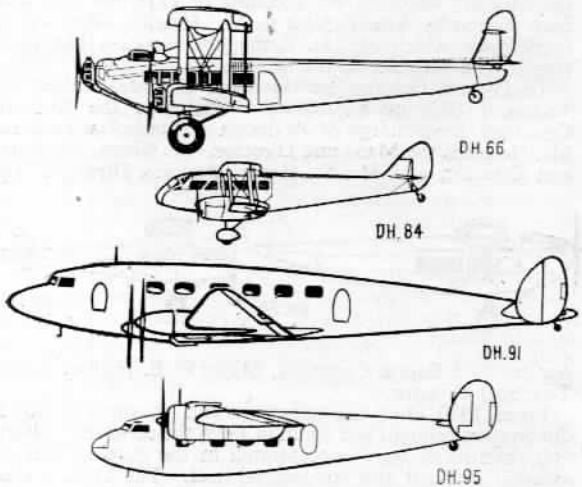


our separate Engine Company, Major F. B. Halford is the Technical Director.

From 1920 until Germany's second attempt at world domination brought war again in 1939, the company's effort and enthusiasm were concentrated in the development of aviation for civil and commercial uses. The D.H.18 was followed by a long cavalcade of transports through the nineteen-twenties and thirties, notably the D.H.34 for the cross-Channel services of 1922, the H.D.50 of two years later, famed for its transport service in Australia, the three-engined Hercules (D.H.66) of 1926 for Imperial Airways, the economical Dragon series starting with the D.H.84 in 1932, the modern 22-passenger four-engined Albatross (D.H.91) of 1938, and the all-metal 12—20-passenger

Flamingo (D.H.95), which was ready for world markets when the war put a stop to its career.

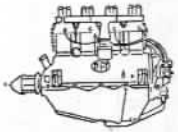
The other strong line of D.H. development was in training and touring aeroplanes. From the early nineteen-twenties our company pioneered the development of reliable, safe



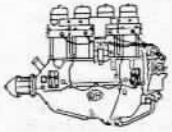
trainers whose design, as it were, crystallised in 1925 in the Moth. The name "Moth" became a household word throughout the world and many variations of the Moth theme (some trainers, others cabin touring types) were built in small and large numbers. The Tiger Moth, now numbered by the ten thousand, has been the most famous, so far.

The first Moths had Cirrus engines, designed by Major Frank Halford in collaboration with Capt. de Havilland, and in 1927, partly owing to the difficulty of getting deliveries, we began to feel that we should develop our own range of engines. The association with Major Halford was then established on a more serious footing and he created the 100 h.p. four-cylinder Gipsy One, the prototype of which, developing 120 h.p., created a stir by establishing a world speed record for light aeroplanes (187 m.p.h.) in the little Tiger Moth racing monoplane (D.H.71, not to be confused with the D.H.82 trainer) piloted by Hubert Broad. One of the early Gipsy Ones did 600 hours' flying in a Moth under Air Ministry seal. When overhauled it called for only £7 2s. 11d. worth of replacements. Durability and reliability were thus the essence of the Gipsy designs from the outset. The Gipsy One started its career with an overhaul period of no less than 450 hours. From 1927 onward (and earlier if we include the Cirrus) Major Halford has designed every de Havilland engine, our largest in the series so far being the 525 h.p. Gipsy Twelve. Tens of thousands of Gipsies have been made and used the world over. They are noted for long life and reliability without equal in the world of aeronautics. Our engine business was budded off as a separate company in February, 1944.

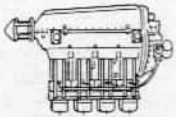
Another landmark in our history was the England–Australia race of 1934. The British Government policy throughout the inter-war period was one of disarmament and appeasement, and partly for this reason artificial aids and subsidies to civil aviation (which might be suspected of concealed militarism) were kept to the minimum, so that our Empire did not boast any fast transport aircraft at the time when this race was announced. It looked as if the honours would go to America, but de Havillands, feeling that some financial risk in producing a special British racer



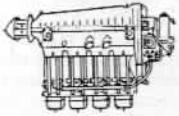
GIPSY ONE
1927



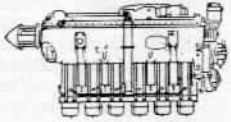
GIPSY TWO
1929



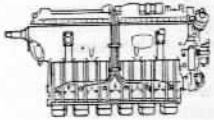
GIPSY THREE
1930



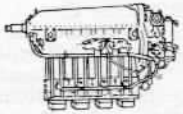
GIPSY MAJOR
1932



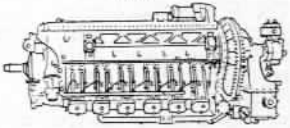
GIPSY SIX
1934



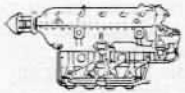
GIPSY SIX II
1935



GIPSY MAJOR II
1936



GIPSY TWELVE
1937



GIPSY MINOR
1938

for this event was justifiable, created the Comet (D.H.88) with two Gipsy Six 200 h.p. engines and a speed of about 225 m.p.h. By flying from England to Australia in 71 hours this graceful two-seat monoplane won the race against big American liners traversing their regular route in comfort with full navigational aids.

The Comet was the first British aeroplane designed around the combination of variable-pitch propellers, wing flaps and retractable undercarriage, and it was in designing it that we became convinced of the enormous future for variable-pitch propellers. Mr. Hearle went to America and at once secured for us the licence for the British Empire for the only tried and successful v.p. propeller then in existence, namely, the Hamilton. It is a significant memory that there was thought to be "no military use" for variable-pitch propellers at that time ! Despite such opinions they soon became standard equipment for almost all aeroplanes except little trainers and touring machines, and, thanks to this foresight, Britain entered the war five years later with a range of thoroughly sound variable-pitch propellers already in enormous production. Indeed, de Havillands had by then become the biggest manufacturers of v.p. propellers in the world, a very fortunate thing for democracy.

An outstanding aspect of D.H. history has been our development of overseas trade and manufacture. In 1927 we formed a small branch company in Australia, now a large manufacturing concern building our Mosquito and other aircraft and our propellers for the war with Japan. In 1928 we started a company in Canada, now a great establishment devoted to the production of Mosquitoes. In 1929 our branch in India was opened ; a small establishment in pre-war days, it is now enlarged and is engaged in overhaul and repair work and component manufacture. In 1930 and

DH.88

1935 we inaugurated de Havilland companies in South Africa and Rhodesia; mainly distributing and servicing concerns, they have been taken over by the authorities to serve the war effort. Early in 1939, specifically to serve the Empire Air Training Scheme, we put up a branch factory in New Zealand to build Tiger Moths.

From the earliest years of our company we have also taken care to appoint good agents for distributing and servicing our products everywhere they were marketed—and that has meant most countries. We became very proud of our world-wide servicing and representation, which was certainly the first organisation of its kind in aviation history. All this overseas development, and particularly our chain of Dominion companies, which provided a strategically dispersed world production system in readiness to put at the disposal of the Empire when war came, was due largely to the foresight and energy of Mr. St. Barbe.

* * *

It is difficult to imagine with any feeling of sureness what sort of England and what sort of world we shall have when the German and Japanese desires for domination have been quenched. We know that the British Empire and Commonwealth will stand in great need of air communications. And we know that in order to maintain and improve our standards of living Great Britain must cultivate new exports because many of the manufactures which we used to market abroad will henceforth be made in the consuming countries.

In de Havillands we have to follow our calling with all diligence and vision, relying upon the enthusiasm that has always been a feature of private enterprise, and knowing that no industry has a more responsible part to play than our own in the shaping of the future.

Published for private circulation within The de Havilland Enterprise
O.J. 58 *Printed by Samson Clarks*