THE DE HAVILLAND AERONAUTICAL TECHNICAL SCHOOL

Twenty-first anniversary and opening of the new headquarters,
Astwick Manor, Hatfield, Hertfordshire, June 18, 1949.

The de Havilland Aeronautical Technical School was formed at Stag Lane, Edgware in 1928 by the then Captain (later Sir) Geoffrey de Havilland and Mr Frank Hearle. The School moved to Hatfield in 1934, soon after the establishment of the new airfield there. The curriculum expanded rapidly to cover the full range of aircraft design, manufacture and operation. The instructors were all practising engineers in the Company, thus students were actively in touch with current problems and techniques. The T.K. series of light aircraft was designed and built between 1932 and 1939, some being flown by Company pilots in events such as the King's Cup Races.

During 1940 the School had to move from Hatfield when its premises were destroyed by fire after a German bombing raid. After a spell in nearby Welwyn Garden City, it moved in 1941 to Salisbury Hall, where the prototype Mosquitos were designed and built, now the home of the de Havilland Aircraft Heritage Centre. In 1947-48 the School was progressively transferred to Astwick Manor, on the north-eastern border of Hatfield aerodrome. The Airspeed hangar, in which the prototype Horsa glider was built, was moved from Salisbury Hall and became the new workshops. They were off the right-hand side of the photograph on page 3 of the brochure. After this photograph was taken hostel accommodation was built on to the right-hand side of the Manor.

Astwick Manor was opened formally by Lord Salisbury on June 18 1949. This brochure was produced to commemorate the occasion and to publicise the extent of the training facilities.

Following the absorption of the Company into Hawker Siddeley Aviation, the name was changed in 1965 to the Hawker Siddeley Aviation (Hatfield) Apprentice Training School. In 1984 the workshops were handed over to St Albans College. In later years the premises were unoccupied, but have since been renovated into luxury apartments.

Roger de Mercado
de Havilland Aeronautical Technical School Association
April 2010

Printed in England by Samson Clark & Co., Ltd., 57-61 Mortimer St., London, W.1

Programme

2.00 to 2.10 p.m. Visitors will be received at the main entrance to the de Havilland factory at Hatfield and conveyed to Astwick Manor, which is two miles away on the north side of the airfield.

2.30 p.m. Opening of the new School Workshop, which will then be available for inspection. There will be an array of apprentices' work and of the current de Havilland types of aircraft.

The new propeller test-beds and the jet-engine test-beds will be open to visitors, also the main aircraft factory where fabrication and assembly of the Chipmunk, Dove and Vampire can be seen.

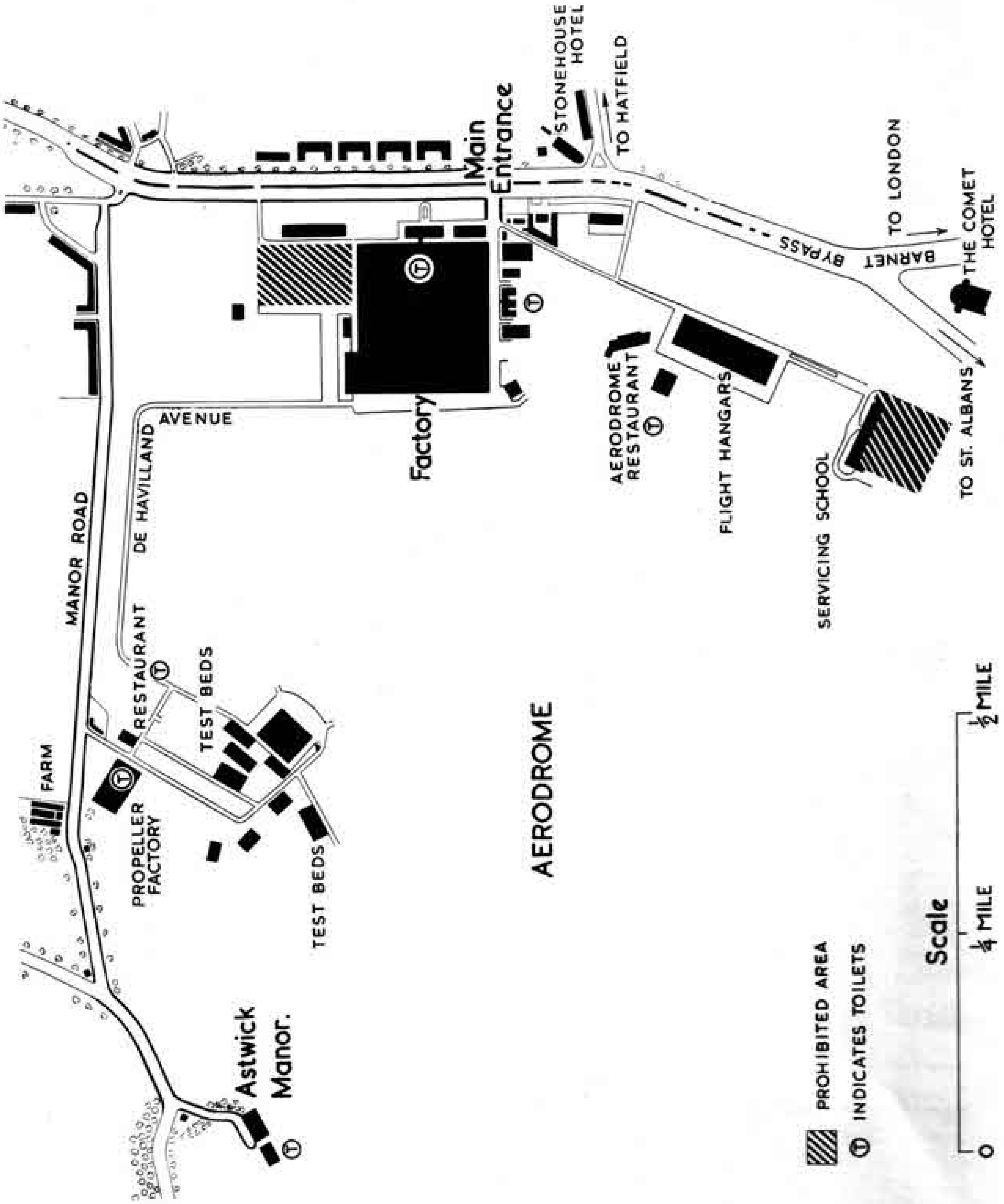
3.45 p.m. onward Tea will be served, to conclude the afternoon's arrangements.

If the weather and other circumstances allow there may be a short flying demonstration.

A plan of the airfield premises appears overleaf.

The prospectus which follows gives an account of the organisation of the de Havilland School, also some notes on the history of the de Havilland Enterprise.

Brief facts concerning the School and its staff are listed on the subsequent pages.


Main Entrance
STONEHOUSE HOTEL
TO HATFIELD
TO LONDON
BARNET BYPASS
THE COMET HOTEL
TO ST. ALBANS
SERVICING SCHOOL
FLIGHT HANGARS
AERODROME RESTAURANT
Factory
DE HAVILLAND AVENUE
MANOR ROAD
RESTAURANT
TEST BEDS
FARM
PROPELLER FACTORY
TEST BEDS
AERODROME
Astwick Manor.
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THE DE HAVILLAND AERONAUTICAL TECHNICAL SCHOOL

PROSPECTUS

Spring 1949

THIS handbook outlines the de Havilland technical training organisation as it is four years after the end of the war. Compulsory military service continues to interfere with the training system, although less seriously than during the war period. The science of aeronautics makes rapid advances, particularly so in Great Britain, where the manufacturing and operating sides of the industry stand ever in need of technicians, especially men with the higher engineering qualifications.

The training needs of young people entering the de Havilland School at different educational levels are outlined in the first chapter of the handbook, on pages 1 to 5, and the channels of training and opportunity available to them are shown in Figure 1 on page 6.

The principle of conducting the practical training within the de Havilland factories and technical departments, and the breadth of instructional opportunity afforded by the enterprise, are discussed in the second chapter, on pages 7 to 11.

Chapters 3 and 4, on pages 12 and 13, explain the apprenticeship courses in detail, and are followed by charts of the theoretical and practical training, Figures 2 to 7, and by several pages of illustrations depicting classroom and workshop instruction.

Chapter 5, on page 22, deals with welfare, sports and recreations.

By way of background a brief outline of de Havilland history, on pages 24 to 30, concludes the prospectus.

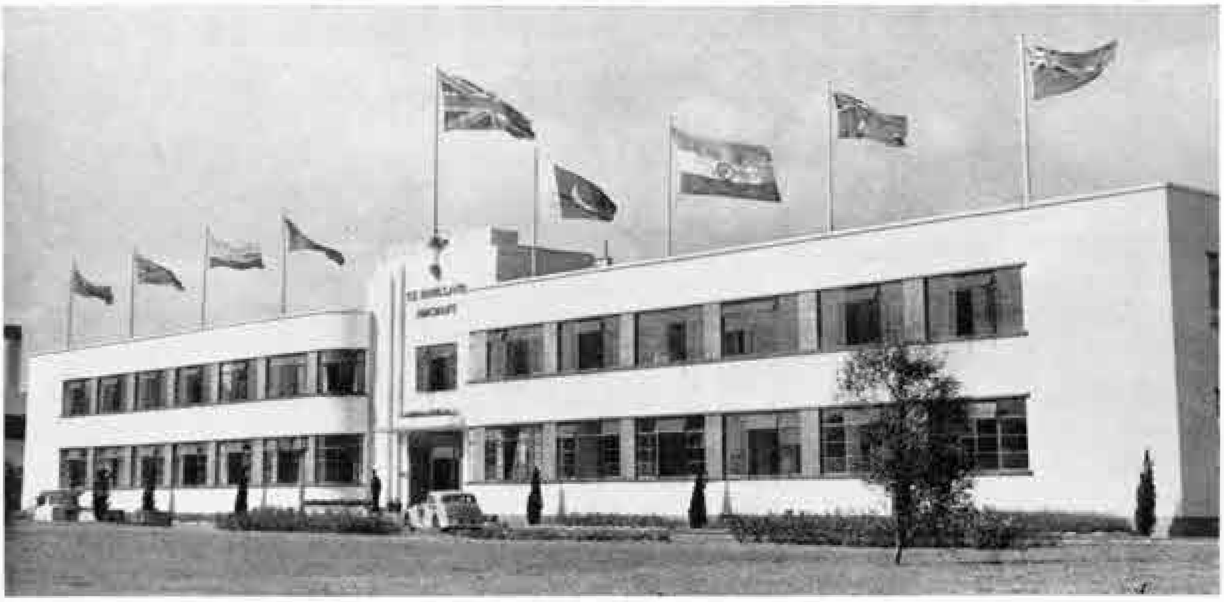
THE DE HAVILLAND AERONAUTICAL TECHNICAL SCHOOL

THE organised training of young men within the de Havilland Aircraft Company began with the introduction of trade apprenticeships in the company's earliest years. Then in 1928 the de Havilland Aeronautical Technical School was founded to provide a comprehensive course of theoretical study as well as practical workshop training. Thus a grade of engineering apprentices came into being whom the School trained to become qualified aeronautical engineers for all branches of the industry.

There have been great developments in the subsequent twenty years, and the training system has grown to a mature establishment. The de Havilland Enterprise has become a group of companies extending to all the principal dominions and embracing research, design and the large-scale production of civil and military aircraft in a wide range of categories, as well as piston engines and gas turbines, propellers, components and accessories. This is significant in that it has been a fundamental principle of the system to conduct the practical side of the training within the factories themselves.

Although by no means a matter of policy it is natural that a growing enterprise should have absorbed a large proportion of the young men it has trained. Many have gone out to the branch companies overseas. Many have found careers in Government service, air transport and flying-school activity at home and abroad. Up to the end of 1948 the School has passed out some 1,650 men, prepared and qualified for technical positions in aviation.

When the war came numbers of apprentices left their training unfinished and joined the Forces, most of them to become airmen and engineer officers, but the demands for technical instruction increased beyond all previous experience, and exemption from military service was granted for indentured apprentices up to the age of twenty.



The headquarters of the de Havilland Enterprise.

The School therefore continued throughout the war, advancing in size, amenities and responsibility. In the summer of 1943 an Education Board was formed to supervise all de Havilland training activities. This Board comprises senior executives of the de Havilland Aircraft, Engine and Propeller Companies. Its opinions and recommendations are made available to a small Council, under the chairmanship of the managing director of the parent company, which directs the policy and methods of the School through its principal.

In addition to providing the technical training of the engineering apprentice, which was its original purpose, the School later assumed responsibility also for the training of all trade apprentices, and a system of scholarships was instituted whereby especially promising trade apprentices, training to become skilled artisans, could be upgraded to the engineering apprenticeship and receive the full theoretical instruction which would qualify them as engineers. A third category of entrant into the School is the engineering graduate ; he is the university student who joins at a later age for the purpose of supplementing his academic training by practical experience and instruction within the industry.

With the exceptions which are made possible by scholarships, fees are paid for the engineering apprenticeship and in some instances post-graduate training. There are no fees for the trade apprenticeship. Except in the case of youths who are not British or Dominion subjects, the engineering graduates and engineering and trade apprentices are paid wages throughout.

The full trade or engineering apprenticeship requires a course of five years. A shortened course of three years was necessarily introduced during the war when indentured apprentices were required to join the Forces at the age of twenty. Since the end of the war this deferment has been extended to a later age and the practice is for apprentices, accepted when they are about seventeen years old, to complete a course condensed into approximately 4½ years before entering military service. It must be emphasised, however, that a five-year training is considered desirable and the fifth year should be completed in the School after release from the Forces, when, in any case, some sort of refresher course would be needed.

The three categories of School entrant will be discussed in turn.

THE ENGINEERING APPRENTICE

The intake of engineering apprentices has consisted mainly of boys entering from secondary or public schools at about 17 years of age, with a general education to the matriculation standard. This class of youth offers promising material, being moderately well founded in basic knowledge, sufficiently unfixed in his notions to be receptive, and, broadly speaking, at the right age and educational level to take up engineering and aeronautics with eagerness. He can be comprehensively trained in practice and theory in four to five years and should have no difficulty in qualifying as a corporate member of the aeronautical or other engineering institutions at the end of that time. A high standard is required at entry and at the review which occurs when a boy has completed his probationary period. Indeed, a high level of assimilation must be maintained throughout the course.

At the end of the course the young engineer is potentially useful in any branch of the industry although he will have specialised in the department for which he has shown himself to be best fitted. There is no distinct course for the business departments but the general technical training is an excellent grounding for the commercial side of aviation, perhaps more so than is the case in other industries.

This class of youth, the engineering apprentice, represents the backbone of the whole training system and provides the main pool from which the industry's future executives are drawn.

THE ENGINEERING GRADUATE

There have always been opportunities for a quite different category of entrant, the university-trained men coming into the aircraft companies with a science degree at the age of about 21 years. Their background and mental attitude are normally more academic than practical and the tendency is for them to be absorbed into the laboratories, aerodynamic and stress departments of the industry. The design side, which is larger in size and scope, as a rule demands a more practical training, and the production and maintenance sides have hitherto held little opportunity for them.

On the other hand, the fundamental knowledge of such men should be at a high level, and it is possible to convert them into the more generally useful technicians and potential executives if they can arrange, after graduating, to spend two years in a technical school, in the course of which they are able to acquire a broader outlook and essential practical experience in the various departments, as well as to round off their aeronautical theory and their study of materials, structures, production subjects, industrial organisation and other such matters. It is especially good for them to have done some work in the industry during university vacations.

The de Havilland School likes to make first acquaintance with these men early in their university career, to encourage and assist them

Astwick Manor, Hertfordshire, the headquarters of the School.

A jet-engine factory at Edgware.

The Welwyn hostel for apprentices.

to take up mechanical work in their holidays (not necessarily at de Havillands) and to guide them according to their aptitude, so that when they come down after graduating a plan for their training in the School may already have been formulated. They are usually ready to take one or other of the engineering institutions' examinations after two years—and if they should be fit to do so earlier it is nevertheless generally unwise to reduce their final training to less than two years.

Young graduates requiring training in only one or two subjects—for instance, specialists not desiring a broad engineering experience—may spend only a short time in the School. Whether remaining with the company thereafter or not it is usually found desirable that they should retain a contact with the School principal for a year or two so as to have the benefit of his guidance in the early stages of their careers.

The post-graduate type of entrant was naturally less evident during the war but is appearing again, and it is expected that our universities will be giving more attention to the aeronautical subjects than hitherto. As a rule, however, it will always be advisable for such men to seek general and practical training in the industry under the supervision of a school authority, rather than to take up ordinary employment straight from the university.

THE TRADE APPRENTICE

The third class of trainee is the boy who leaves school at 16, usually without having sat for the School Certificate examination, and applies to be taken on as a trade apprentice.

With him may be considered the youngster who has to turn out into a factory even earlier, and who is encouraged to take up an apprenticeship after he has been at the bench for a year or so. Until the school-leaving age was raised in 1947, under the legislation of 1944, such boys were entering the industry from 14 years upwards. Now they may not leave school until they are 15. All such youngsters come under the watchful eye of the de Havilland educational staff and are helped to appreciate

Engine experimental shops and school at Stag Lane.

The de Havilland school of flying near Hertford.

The Toronto factory photographed during the war.

The factory at Wellington, New Zealand.

the advantages of apprenticeship as against the idea of picking up a trade. While the national problems of shortage of teachers and school premises persist industry is faced with substantial responsibilities to such boys, all of whom stand in need of general teaching and physical care. Those who can be interested in apprenticeship are encouraged to prepare for it by taking continuation classes in general subjects, and are told that without such study they will have little chance of being accepted.

The de Havilland School, taking over the boy's training when he is accepted as an apprentice, endeavours to continue the general subjects while steadily initiating his aeronautical studies. Classes are arranged in conjunction with the county authorities, and the policy is to give increasing attention to Empire history, citizenship, current ideas and ideals. More interest is being shown, particularly, in the history of the de Havilland Enterprise. It is useless filling boys' heads with technicalities until the basic education has taken root. They must learn about their country and their industry, acquire a pride in work, and appreciate where they are heading.

The younger the boy when he enters industry the more difficult it obviously is to train him for an executive post, but by broadening the scope of the classroom curriculum during apprenticeship the door can be and has been opened. Serving trade apprentices in de Havilland factories have the opportunity of upgrading by scholarship at the age of 18 years to the full status of the engineering apprentice, which enables them to take the complete training of an aeronautical engineer.

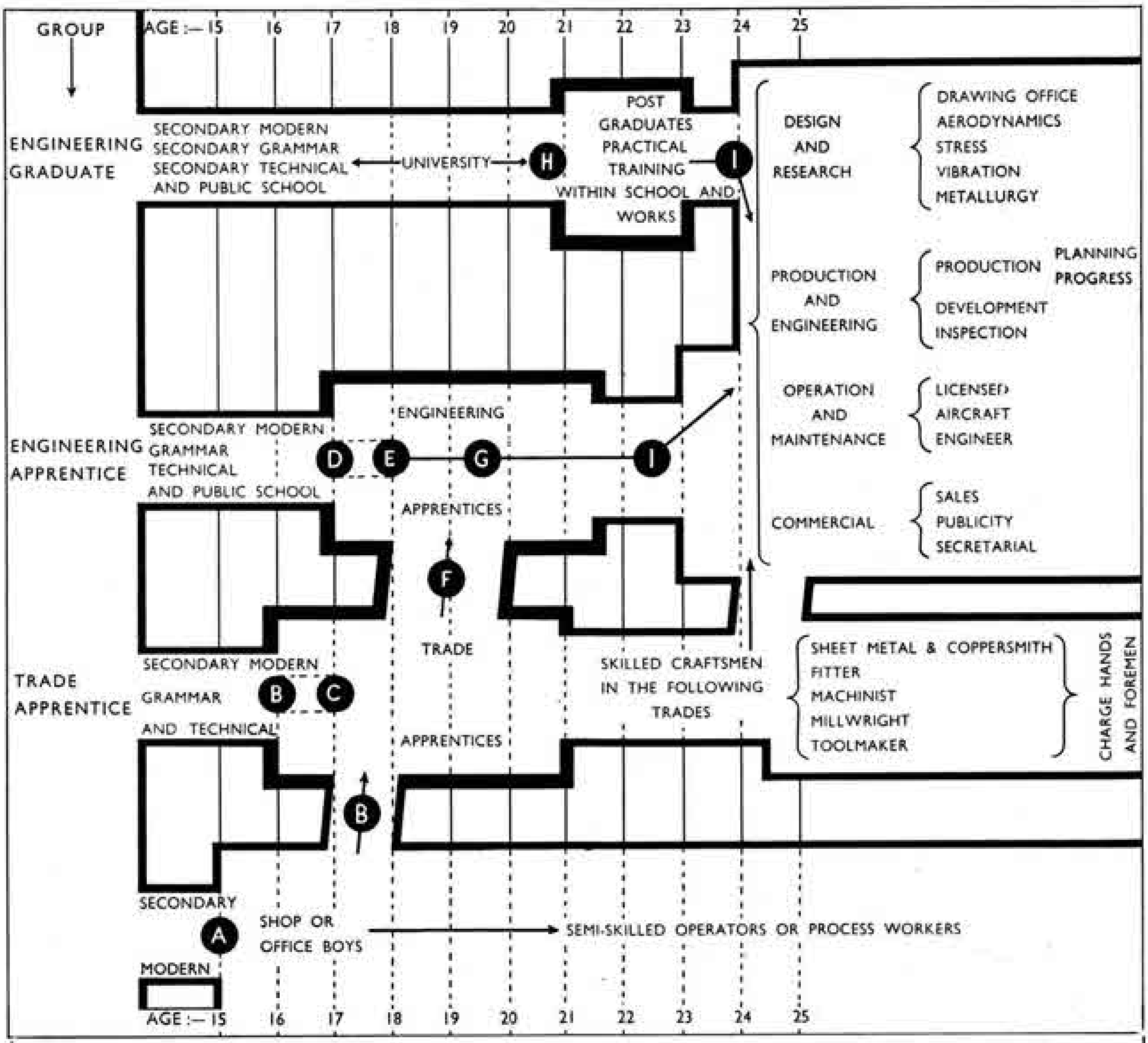
It is possible, although not easy in the circumstances, for them to matriculate ; the de Havilland School does not prepare them for matriculation, and they are able to qualify for the engineering diplomas without it, if satisfactorily reported by the School. This usually involves taking an extra section in the engineering institution's examination.

This system of upgrading the promising trade apprentice has proved valuable in every way and is yielding excellent results.

A propeller factory at Sydney, Australia.

The main aircraft factory at Bankstown, Sydney.

TRAINING AND OPPORTUNITY



KEY

A. Works Interview and Test ; Medical Examination.

B. School Certificate or Works Test. Selection Board and Medical Examination.

C. School Examination at end of Probationary Period for Indentures.

D. Engineering Apprenticeship Selection Board, Interview and Medical Examination.
Qualifications required :— School Certificate with Matriculation Exemption, or its equivalent, or Third-Year Technical School Certificate.

E. School Examination at end of Probationary Period for Agreement.

F. Selection Board for Upgrading.

G. Higher School Certificate, or Intermediate B.Sc., or Ordinary National Certificate ; Selection Board and Medical Examination.

H. University Degree or Diploma or Higher National Certificate and Interview.

I. Period of Employment to gain additional experience.

Note :—The Age Scale along the top of the Chart is intended to represent an average. National Service Regulations necessitate adjustment to suit certain ex-Service applicants.

Chapter 2. TRAINING AND OPPORTUNITY

THE first chapter of this prospectus has dealt with the three main classes of young entrant into the aircraft industry. It should now be explained that the course of training on the engine and propeller sides is basically different from that on the aircraft side. It is essentially mechanical rather than aerodynamic, and is aimed at the National Certificate and Higher National Certificate, whereas the aircraft training leads logically to the examinations of the Royal Aeronautical Society and the Institution of Production Engineers. An early decision is necessary in regard to both the engineering apprenticeship and the trade apprenticeship as to whether the entrant intends to take his training in aircraft or in power units. The latest stage at which the choice can be made without a material extension of the overall time for the training course is the close of the probationary period. The engineering graduate in most cases will have specialised to some extent during his period at the university.

The chart on page 6 shows the channels of opportunity for the different classes of entrant. This represents the general plan, without regard for the shortening of courses that has been necessitated by compulsory military service during and since the war. The ages indicated are not rigid ; indeed some flexibility is inevitable throughout.

Further specialisation takes place as a gradual process according to the aptitude of the youth as his apprenticeship progresses.

Except for elementary instruction in handicraft and the use of tools, which is conducted in the School workshops, all of the practical training is undertaken in the de Havilland factories, laboratories and offices. Important matters of principle are involved in this policy. It is necessary that the basic instruction should take place in a School workshop which is virtually a classroom, but there are disadvantages in allowing a large part of the apprentice's course to be spent in this atmosphere of generalities. Long experience has shown without doubt that young people work with far more enthusiasm and application if they are engaged in the actual tasks and problems of industry. The attitude of an apprentice doing specimen work at a bench, for an instructor's approval, is altogether different from that which he assumes when the component on which he is working must pass the final routine of factory inspection and be embodied in an aircraft. A high sense of responsibility is engendered by this method of instruction. The theoretical classes which the apprentice attends, likewise, appear to him in an altogether different light when the lessons learned are made comprehensible by continuous close contact with example, and when the apprentice in the course of his daily work is occupied in the application of theory to practice.

It is, of course, important that this practical experience should be comprehensive. If a boy is specialising on the aircraft side it is desirable that he should have experience in aircraft of widely differing classes, military and civil, small and large, propeller-driven and jet-propelled, and he should be afforded adequate opportunities for studying the power unit so far as may be necessary to his career. If he sets out to be an engine specialist his experience must embrace both piston engines and gas turbines and he must have ample opportunities to study propellers of all kinds and to occupy himself with aircraft matters. A propeller engineer is very closely concerned with engine design, including turbines, and with aircraft considerations.

Thus, if the principle of conducting the practical training within the industry be accepted, and if it is to be arranged within the scope of one industrial concern, then that concern must of necessity encompass the design and production of the three major components, namely, the aircraft, the engine and the propeller, and it is essential nowadays that the engine side should include both piston engines and gas turbines. It is also important that the aircraft side should comprise a wide variety of categories, for their design features differ enormously.

The de Havilland Enterprise is unique in the world of aviation in the scope and character of its activities. It comprises three main companies, in England, building aircraft, engines and propellers, subsidiary industrial interests making components, flying school and other activities, and it has associated companies in all the main dominions including full-scale manufacturing establishments overseas.

Dove aircraft assembly lines, England.

Chipmunks ready for testing, Canada.

Drover in preparation for flight, Australia.

Gipsy engine repair, Australia.

Moreover, each of its main companies covers a wide range of products and all are highly modern in the technical sense. The de Havilland Aircraft Company has held a leading position in the spheres of economical transport aircraft and trainers and other light aeroplanes since the close of the 1914–18 war; and since 1939 it has risen to a place of eminence in regard to high-performance military machines. Indeed, the de Havilland Company pioneered the light-aeroplane movement from 1926 and made possible unsubsidised transport operation on the light traffic of the 1930's. Both these developments were world-wide in their influence. Out of this experience the Company provided the principal basic trainer for the 1939–45 war. In the Mosquito it created one of the most effective weapons of the Royal Air Force, and the fastest aircraft in service for nearly half of the war period. This led to the Hornet long-range fighter of even higher performance, and to Britain's first practical single-engined jet fighter, the Vampire. These three aircraft, in production in 1947, have made history also in naval carrier-borne activities. The Company has vigorously pursued its work on jet propulsion and recently embarked upon a high national responsibility in the form of a jet-propelled transatlantic airliner. At the same time its factories are producing military aircraft and small transports.

From the point of view of apprentice experience an interesting feature is that the Company has shown versatility in regard to fabrication processes. Up to the war most of its aircraft were made of wood, and special methods of wood and composite construction were evolved for combat aircraft. Since the war, advanced forms of metal construction have been developed, including methods of cementing metal to metal. All of this technique comes within the scope of the apprentice training.

From 1927 up to the war de Havilland built piston engines in the smaller categories, which have been extensively used in all parts of the world. The de Havilland Company was the first of the established British aero-engine builders to take up the design of jet engines, which it did at the beginning of 1941. Benefiting from the close working association between the technical departments of its aircraft and engine divisions it has attained a prominent position in the world in regard to gas turbines and their effective use, and meanwhile actively continues the production of modern piston engines. The de Havilland Company

Jet-engine instruction, Canada.

Propeller assembly, England.

Gipsy engine assembly, England.

Apprentices fitting a Goblin engine in a Vampire.

introduced the commercial manufacture of variable-pitch propellers into Great Britain in 1935 and produced the major share of all the propellers used by the Royal Air Force in the recent war. It occupies a position of undisputed leadership in propeller developments in this country.

It has been necessary to give this résumé of de Havilland activities in order to make clear that the broad scope which is required for the adequate training of an engineer in this industry is in fact afforded. It cannot be too strongly emphasised, from the point of view of its value to the training, that the work on which the factories and departments are engaged is of an advanced character by contemporary standards, and that there is especial significance in the association of aircraft, engine and propeller design within the one organisation, particularly as flying speeds and technical complications increase. The departments grow ever more interdependent and much of the research and laboratory work is associated. Laboratories for high-altitude investigation, instrumentation, metallurgy, metrology and electronics may be mentioned, all of which offer opportunities at different stages in the training.

SELECTION

The discovery of aptitude occurs as a selective process during the period of apprenticeship. In the Aircraft Company there are three main channels of opportunity. Those with a leaning towards design, stressing and aerodynamics specialise increasingly, particularly over their last three years, in the subjects required for the Associate Fellowship examination of the Royal Aeronautical Society. Those with a bent for production engineering prepare for the graduate examination of the Institution of Production Engineers. Those who appear best fitted for a career on the maintenance side prepare for the Air Ministry's examinations for aircraft engineers' licences including the licences for engines and propellers.

Specialisation is on rather different lines in the Engine and Propeller Companies. Here all engineering apprentices are prepared for the National Certificate, which represents a good intermediate standard in mechanical engineering and is taken at the age of 18 or thereabouts. Thereafter apprentices begin to specialise towards design and stress work, in either engines or

A bench-work instruction class.

Precision measurement by optical methods.

Servicing a Sea Hornet.

Daily inspection of the Chipmunk.

propellers, or towards production and maintenance aspects of both engines and propellers. It is understood, of course, that engine studies include both piston engines and turbines. Those taking design and stress subjects proceed to the Higher National Certificate and/or the associate examinations of the Institution of Mechanical Engineers or the Royal Aeronautical Society, while those specialising in production and maintenance take the subjects leading towards the graduate examination of the Institution of Production Engineers.

Some commercial subjects are given, but up to now there has been no distinct course of training for the commercial side of the industry, it having been found that the general technical training provides a sound basis for people taking up positions within the marketing organisation of the de Havilland Enterprise or of other companies.

The upgrading of trade apprentices by scholarship occurs generally in the first year or two of training. This opportunity means much to the future prospects of the individual and is afforded in recognition of progress made in the theoretical and practical branches of the work and of all-round qualities of intelligence, character and personality. The classroom instruction is available to all trade apprentices and their application and assimilation are closely watched.

In chapter 1 a passing reference was made to the question of breadth of experience after the apprenticeship is completed. It is important that at the end of his training a young man should have a change of scene, to see the industry in a different perspective and to learn to stand upon his own feet. Whilst it is true that a large number of de Havilland apprentices have stayed within the Enterprise, the exceptionally wide scope of its constituent companies, with their separate executives and premises, has in effect provided, in large measure, the opportunities for a fresh approach which are desirable. Because the de Havilland business has always been of a world-wide nature, chances of travel have never been lacking and the associated de Havilland companies in Canada and Australia and the other dominions have welcomed trainees from England who wished to leave the home country temporarily or permanently. The exchange works both ways, so that technicians from the overseas companies are often attached to the factories in England. The School is never without a proportion

Vampires for the Swedish Air Force.

Sheet-metal detail work.

Servicing a Dove light transport.

Work on plastic canopies.

of graduates and apprentices from British and foreign countries overseas. On the other hand, the spearhead of technical progress and the centre of highest opportunity for senior technicians is to be found within Great Britain.

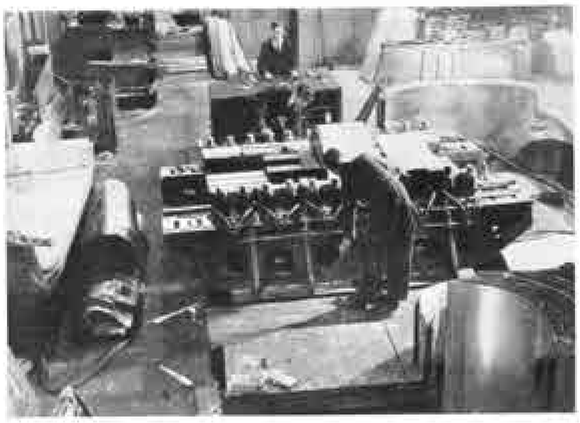
The de Havilland School has always worked in close relationship with the Ministry of Education and the county education authorities. Its staff, facilities and methods are officially inspected and approved, just as its syllabuses are examined and recognised by the Royal Aeronautical Society and other academic bodies.

Collaboration with the municipal education officers is extending in two directions. They are giving all the help and supervision they can in the general teaching of the very young people in industry, and they are making available the amenities of their polytechnics for the more advanced subjects. It is logical that with their larger resources the counties can provide more elaborately equipped physical laboratories for the general engineering studies than any one industrial company is able to afford, and it becomes more satisfactory for aviation and other industries to use the county facilities for these particular subjects.

It is clear that the function of any industrial training scheme is a double process of filtration. The intake consists of young men of varying ages, character, ability and educational level. The duty of the School is to sort them and provide the instruction needed to fill the educational gaps. As they progress the outward filtering process must be applied, selecting and developing the individuals for careers according to their bent. The School must strive to equalise the opportunity and to appreciate the maturing personality.

Aviation became Britain's biggest industry while we were at war. That is because it is one of the most potent sciences of these times, and in war its power is naturally exploited to the utmost. It is not essentially an instrument of destruction any more than is chemistry. Indeed, it has immense opportunities in broadening the outlook by travel and intercourse and thereby promoting the spirit of co-operation. The very experience of flying engenders a sense of the unity of man. Great tasks of reconstruction await aviation, and no industry has a more responsible part to play in the shaping of the future.

Learning to operate the stretcher press.



The lofting process in aircraft layout.

ENGINEERING APPRENTICESHIP

IN setting forth the apprenticeship conditions in detail, this and the following chapter inevitably reiterate some of the generalities already discussed.

The full period of the engineering apprenticeship is approximately 4½ years from the age of about 17 years—rather earlier in the case of engine and propeller apprentices. It is preceded by a probationary period of about six months before the indentures are signed, so that normally the complete course takes five years. The National Service regulations are altered from time to time. At the close of 1947 the position was that provided a boy was accepted into the School without any break in his studies he would be allowed to complete his training without being called up for military service.

Entrant application forms and details of fees are available from The Principal, The de Havilland Aeronautical Technical School, Hatfield, Hertfordshire. A certain number of free engineering apprenticeships are granted annually by scholarship among the serving trade apprentices and to outside applicants. Additionally, some scholarships and grants for the de Havilland and other schools are available through the Society of British Aircraft Constructors and through certain county councils.

Education to the matriculation or equivalent standard is a necessary qualification for entrance. Applications are considered by a selection committee comprising one member of the de Havilland Education Board, the School principal, his chief education officer, the apprentice supervisor, and appropriate de Havilland executives drawn from a panel. Each candidate is interviewed by this committee. A standard of physical fitness also is required.

The entrant is trained from the outset either in the Aircraft Company or in the Engine and Propeller Companies. The curriculum of practical and theoretical training is partially common to both groups, especially in the early stages.

For the probationary period and the first few months of apprenticeship the practical work is done in the School workshops, and consists of basic instruction in methods of fabrication and the use of hand and machine tools. As much as a year is spent in these shops. Experience has shown that "practice work" loses its interest and value once the initial training has taken root, and a fundamental feature of the de Havilland system (as explained in chapter 2) is that the youth spends the remainder of his time in the productive workshops and departments of the organisation, giving him a wide, realistic and authentic experience in the latest practices of the industry. All his work is subjected to the routine inspection of the factory and must therefore satisfy the full Air Ministry standards.

He spends a period in each of the appropriate departments (See Figures 4 and 5), beginning with those which afford groundwork of the least specialised nature. He is regularly visited and his progress is controlled and recorded by the apprentice supervisor. He is subject to the routine and discipline of the factory like any ordinary employee. Except in the case of youths recruited from outside the British Empire and Commonwealth he is paid wages, from the day when he enters as a probationer, at the hourly rates for his trade and age. The rates vary slightly from time to time. In January, 1949, they were approximately as follows :—

1st year, per week...	...	£1 16 4
2nd year, per week...	...	£2 10 2
3rd year, per week...	...	£2 18 7
4th year, per week...	...	£3 9 9

In the latter part of his time and as his aptitude develops the boy's practical training becomes more specialised, and he spends longer periods in the departments concerned specifically with design or production or maintenance. He is by then doing quite serious and responsible work. A feature of the aviation industry is the relatively high sense of responsibility which it engenders.

Figures 2 and 3 on page 14 show the plan of theoretical study, as spread over the five years of the full course, from 17 to 22 years in the Aircraft Company, from 16 to 21 years in the Engine Company and Propeller Company (subject to the interruptions of military service). They also show the year of preliminary theory (from 16 to 17) for those who start at the earlier age.

The course at present is based upon Figures 2 and 3 but is condensed into the four years from 17 to 21. There are both daytime and evening classes but the aim is to minimize evening work. Attendance throughout the course is required of all engineering apprentices.

The curriculum, although necessarily condensed, does not over-tax the average boy, and covers adequately the examination syllabuses of the Aeronautical and Production Engineering Institutions, the National Certificate and the Aircraft Engineering Licences. The Higher National standard can be attained by the age of 20. In the case of aircraft engineers' licences it is not permissible to sit for the Air Ministry exams. before the age of 21.

It must be emphasised that a good educational and general standard is required by the selection committee when interviewing candidates for entry, and that only those who make really sound progress during the probationary period can be accepted for apprenticeship.

ENGINEERING GRADUATESHIP

The opportunities and needs of the young man who enters the School after graduating at a university have been outlined in the opening chapter of this prospectus (page 3) and it will be appreciated that arrangements and fees for this class of entrant must vary with individual circumstances. Candidates should apply for interview and should bring documentary evidence of the work they have done.

The measure of technical advance in the industry since the war has raised the standards required of young engineers and improved the opportunities for this category of young men, who possess a higher theoretical training in certain directions than the de Havilland School affords but lack knowledge of the aircraft industry and of current aeronautical practice.

TRADE APPRENTICESHIP

THE full period of the trade apprenticeship is approximately 4½ years from the age of about 16½ years, this applying to aircraft, engine and propeller apprentices alike. It is preceded (as is the engineering apprenticeship) by a probationary period of six months before the indentures are signed, so normally the complete course takes five years from the age of 16.

The National Service regulations are altered from time to time. At the close of 1947 the position was that trade apprentices were not called up for military service until the age of twenty-one, so that their technical training could be completed.

In practice, therefore, the boy ought to enter the School at 16, and the highest age at which he should enter, in order that the training period may not be reduced to less than four years, is 16½ (16¾ if he has special qualifications) so that he may complete a short probationary period and be indentured by his 17th birthday.

The trade apprentice is accepted in the first place to be trained for artisan employment. As a trained craftsman he naturally has a better opportunity for promotion to the supervision staff than a young man who is not apprenticed. Boys who had joined the company as ordinary employees also are encouraged to apply for apprenticeship, the object being to discourage the practice of putting young boys out to work with no particular plan for their training for a recognised trade and status in industry.

Applicants must have had elementary schooling with manual and practical classwork, or secondary schooling, and must show mechanical aptitude. Each candidate is interviewed by a selection board. The vacancies are limited and usually there is a waiting list.

The entrant is trained from the outset either in the Aircraft Company or in the Engine and Propeller Companies. The early practical training is largely common but in later stages there are many differences.

For the probationary period and the first few months of apprenticeship the practical work is done in the School workshops and consists of basic instruction in workshop procedure and the use of tools.

As much as a year may be spent in the School workshops but in the present times the basic use of tools is taught in about eight months, varying with the boy's ability. When the workshop instructors are satisfied, and provided that the progress in general and technical classes is satisfactory and the boy is physically fit and suitable for factory work, he is passed into the production workshops of the company in the trade for which he has been apprenticed. The practical training for the various trades is shown in Figures 6 and 7 on page 17.

All of the apprentice's work, from the time of his promotion to work in the factories, is subject to the routine inspection so that his sense of responsibility is developed from the earliest stage. He is regularly visited and his progress is controlled and reported by the apprentice supervisor in consultation with the shop foreman. He is subject to the discipline of the factory and, from the day when he enters as a probationer, is paid wages at the hourly rates for his trade and age. The basic rates vary slightly from time to time, but in January, 1949, they were as follows :—

Age	*Hourly rate*
16	8·37d.
17	9·9d.
18	13·6d.
19	15·98d.
20	19·02d.

During his probationary period and onward the boy is required to attend daytime theoretical classes in general and technical subjects, amounting to as much as two days in the week. In the later years he must also attend evening classes in technical subjects, amounting to a maximum of two hours on three evenings per week. The aim is to minimise evening work. This theoretical training is arranged in conjunction with the county educational authorities.

The curriculum of theoretical training is given in Figures 2 and 3 on page 14 and is common to both engineering and trade apprentices. The trade apprentice is required to attend these courses so far as his ability allows, and individual attention is given (for instance, special classes at technical colleges outside the usual curriculum) to help promising young apprentices along in their weaker subjects and to make up for their early school-leaving, so far as possible.

Boys who can assimilate the teaching in mathematics, engineering science, draughtsmanship, etc., stand a good chance of obtaining a scholarship which will upgrade them to the engineering apprenticeship, making available without fees the full training of an aeronautical engineer. Thus there is every possible opportunity for the trade apprentice, provided that his original schooling was soundly conducted and that he has the grounding and ability to keep pace with his general and technical teaching during apprenticeship. Examinations are held for these scholarships but the general character, personality and all-round qualities of each boy are taken into account as well as his technical achievement. There is nothing to prevent a trade apprentice from rising to the top of the industry.

THEORETICAL TRAINING

Engineering Graduate, Engineering Apprentice and Trade Apprentice

Aircraft Company

16 Years	Pre-training for Trade Apprentices in all divisions of the Enterprise.	English, English Literature, Industrial History, Commercial Geography, Mathematics, Engineering Science, Engineering Drawing, Workshop Practice, Physical Training.	
17 Years	Mathematics, Mechanics, Drawing Practice, Workshop Practice, Physics (Heat, Light and Sound).		
18 Years	Mathematics, Mechanics, Drawing Practice, Workshop Technology, Physics (Electricity and Magnetism).		
	Design, Stressing & Aerodynamics	*Production Engineering*	*Aircraft & Engine Maintenance*
19 Years	Mathematics, Mechanics, Drawing and Design, Aerodynamics, Metallurgy.	Mathematics, Mechanics, Jig and Tool Design, Metallurgy.	Mathematics, Mechanics, Theory of I.C. Engines, Aircraft Engineering A and C, Aerodynamics, Electrical Technology.
20 Years	Mathematics, Drawing and Design, Aerodynamics, Structures, Metallurgy, Thermodynamics.	Mathematics, Jig and Tool Design, Factory Organisation, Metallurgy, Materials Laboratory.	Aircraft Engineering A, C and X, Electrical Technology, Metallurgy, Thermodynamics and Theory of I.C. Engines, Theory of Machines and Hydraulics.
21 Years	Mathematics, Drawing and Design, Structures, Aircraft Materials (Plastics, Dopes, Cements, etc.), Thermodynamics.	Jig and Tool Design, Commercial Practice, Aircraft Materials (Plastics, Dopes, Cements, etc.).	Aircraft Engineering B and D, Radio Communication, Aircraft Materials, (Plastics, Dopes, Cements, etc.), Commercial Practice.
22 Years	**Associate Fellowship Examination, Royal Aeronautical Society**	**Graduate Examination, Institution of Production Engineers**	**Aircraft Engineers' A, B, C, D & X Licences Examination, Air Ministry**

Note.—Under the National Service conditions prevailing in 1947 the training outlined above is condensed into about four years, ending at the age of twenty-one. For that reason it is not possible for apprentices on the Design Side of the Aircraft Division to take all the subjects listed. Instead, by an arrangement which is acceptable to the R.Ae.S., they specialise in either Stressing or Aerodynamics.

Figure Two

Engine and Propeller Companies

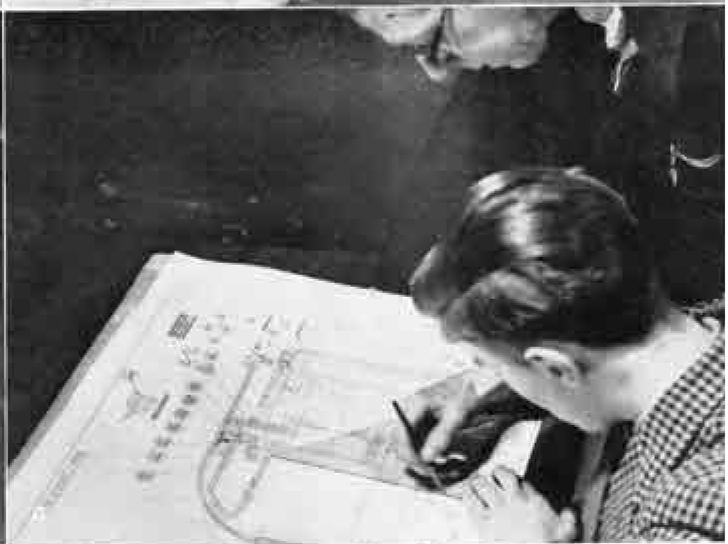
16 Years	Pre-training for apprentices in all divisions of the Enterprise.	English, English Literature, Industrial History, Commercial Geography, Mathematics, Engineering Science, Engineering Drawing, Workshop Practice, Physical Training.	
17 Years	Mathematics, Engineering Science, Engineering Drawing, Jig and Tool Drawing.		
18 Years	Mathematics, Applied Mechanics, Heat Engines, Metallurgy, Jig & Tool Design.		
	National Certificate Examination		
	Design and Stress (Piston and Turbine Engine)	*Design and Stress (Propeller)*	*Production and Maintenance (Engine and Propeller)*
19 Years	Mathematics, Theory of I.C. Engines (piston and turbine), Theory of Machines and Hydraulics, Metallurgy, Factory Organisation, Materials (Fuels, Plastics, Rubber, Timber, Dopes, etc.).	Mathematics, Theory of I.C. Engines (piston and turbine), Theory of Machines and Hydraulics, Metallurgy, Factory Organisation, Aerodynamics.	Mathematics, Factory Organisation, Theory of Machines and Hydraulics, Jig and Tool Design, Metallurgy.
20 Years	Mathematics, Theory of Machines, Strength of Materials, Theory of Structures, Piston and Turbine Engine Design, Materials Laboratory.	Mathematics, Theory of Machines, Strength of Materials, Theory of Structures, Materials Laboratory, Aerodynamics.	Commercial Practice, Workshop Technology, Materials Laboratory.
21 Years	**Higher National Certificate Examination, Associate Membership Examination of the Institution of Mechanical Engineers, and Associate Fellowship Examination of the Royal Aeronautical Society**		**Graduate Examination of the Institution of Production Engineers**

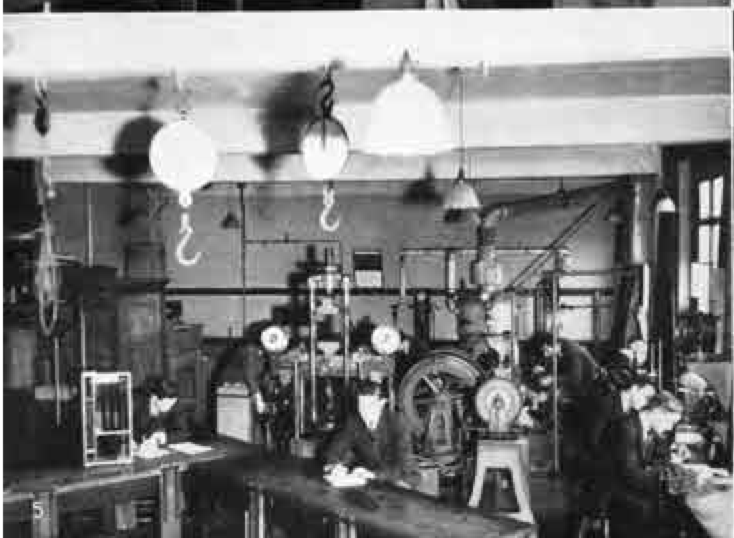
Note.—Under the National Service conditions prevailing in 1947 the training outlined above is condensed into about four years, ending at the age of twenty-one.

Figure Three

THEORETICAL TRAINING

1. *A design class in the Aircraft Company.*
2. *Aircraft engineers studying electrical services.*
3. *Aircraft engineers' instruction on airframes.*
4. *Apprenticeship tuition in draughtsmanship.*
5. *Laboratory work at a county technical school.*
6. *A lecture on highly stressed metal structures.*





PRACTICAL TRAINING

Engineering Apprentices

Aircraft Company

1st Year in D.H. School Workshops	Basic use of tools in each of the following sections :— Woodwork, Fitting, Sheet Metal Work, Machining, Drawing.		The first half-year is a probationary period.
2nd Year in D.H. Factories	Timber Inspection, Wood Detail, Fitting Shop, Machine Shop, Foundry, Pattern Making, Casting, Rubber and Stretcher Press, Drop Hammer, Jigs and Fixtures.		
	Design.	*Production.*	*Aircraft Maintenance*
3rd Year in D.H. Factories	Material Test Laboratory, Heat Treatment, Processes, Fabric and Dope, Hydraulic and Electrical Departments, Propeller Course, Instrument Test Laboratory.	Materials Test Laboratory, Heat Treatment, Processes, Fabric and Dope, Hydraulic and Electrical Departments, Tool Room, Works Maintenance Dept.	Materials Test Laboratory, Heat Treatment, Processes, Fabric and Dope, Hydraulic and Electrical Departments, Engine Cowling, Erecting.
4th Year in D.H. Factories	Erecting Shops, Piston and Turbine Engine Installation, Loft, Flight Test, Structural Test Laboratory.	Erecting Shop, Stores Control, Production Machining, Methods and Rate Fixing.	Erecting Shop, Piston and Turbine Engine Build, Repair and Installation, Magneto and Carburettor Test, Propeller Course.
5th Year in D.H. Factories	Drawing Office, Aerodynamics Department, Stress Office.	Cost Estimating and Accounts, Jig and Tool Drawing Office.	Instrument Test Laboratory, Flight Test, Aircraft Repair and Maintenance.

Note.—Under the National Service conditions prevailing in 1947 the training outlined above is condensed into about four years, ending at the age of twenty-one.

Figure Four

Engine and Propeller Companies

1st Year in D.H. School Workshops	Basic use of tools in each of the following sections :— Fitting, Machining, Drawing, Internal-combustion Engines.		The first half-year is a probationary period.
2nd Year in D.H. Factories	Treatments, Fitting, Machining, Tool Room.		
	Piston and Turbine Engine Design.	*Propeller Design.*	*Engine and Propeller Production and Maintenance.*
3rd Year in D.H. Factories	Engine Assembly, Propeller Course, Engine Test, Engine Repair, Laboratory, Magneto and Carburettor Overhaul and Test, Inspection.	Propeller Course, Engine Assembly, Propeller Test, Propeller Repair, Inspection, Laboratory.	Production Machining, Engine and Propeller Assembly, Engine and Propeller Test, Plant Maintenance, Inspection, Stores.
4th and 5th Years in D.H. Factories	Engine Development, Drawing Office, Vibration Test.	Propeller Development, Vibration Test, Drawing Office.	Methods and Rate Fixing, Planning, Jig and Tool Drawing Office.

Note.—Under the National Service conditions prevailing in 1947 the training outlined above is condensed into about four years, ending at the age of twenty-one.

Figure Five

PRACTICAL TRAINING

Trade Apprentices

Aircraft Company

1st Year in D.H. School Workshops	Basic use of tools in each of the following sections :— Woodwork, Fitting, Sheet Metal Work, Machining.			The first half-year is a probationary period.	
2nd to 5th Years in D.H. Factories	*Pattern and Jig Maker.*	*Fitter (Aircraft).*	*Toolmaker.*	*Machinist.*	*Coppersmith and Sheet Metal Worker.*
	Wood Mill, Wood Detail, Timber Inspection, Pattern Making, Aero Jigs, Advanced Aircraft Construction Work as in Experimental Shop.	**Fitting Shop :—** General, Bench Fitting, Welding, Pipe Bending, Heat Treatment, Processes, Inspection, Aero Tools, Experimental, Press, Foundry, Specialised Aircraft Fitting.	**Tool Room and Aero Tools :—** Shaping, Turning and Milling, Surface and Universal Grinding, Setting-up and Marking-off, Templates, Layout and Development, Bend Blocks, Press Tools, Drilling Fixtures, Precision Tools, Jig Boring, Tool Inspection.	**Machine Shop :—** Shaping, Horizontal and Vertical Milling, Boring, Drilling, Grinding, Planing, Slotting. Capstans : Operating and Setting, Turning, including Screw Cutting, Face-plate Setting. Machine Repairs, Inspection. **Experimental Shop :** Machining from solid.	**Sheet Metal Shop:** General Sheet Metal Work, including :— Drop Hammer, Rubber and Stretcher Presses, Tank Making, Coppersmithing, Cowl Fixing, Panel Beating, Marking-off and Setting-out, Inspection. **Experimental Shop**

Note.—Under the National Service conditions prevailing in 1947 the training outlined above is condensed into about four years, ending at the age of twenty-one.

Figure Six

Engine and Propeller Companies

1st Year in D.H. School Workshops	Basic use of tools in each of the following sections :— Fitting, Machining, Internal Combustion Engines.		The first half-year is a probationary period.
2nd to 5th Years in D.H. Factories	*Fitter (Piston and Turbine Engines and Propellers).*	*Toolmaker.*	*Machinist.*
	Fitting Shop :— General, Bench Fitting, Heat Treatment, Anti-corrosive Treatment and Plating, Processes, Inspection. **Engine—** Assembly, Repair, Testing. **Propeller—** Assembly, Repair. **Experimental Shops.**	Cutter Grinding, Tool Hardening. **Tool Room :—** Shaping, Turning, Milling, Surface, Universal and Internal Grinding. Setting-up and Marking-off Templates, Press Tools, Drilling Fixtures, Tool Inspection.	Heat Treatment, Cutter Grinding. **Machine Shop :—** Shaping, Horizontal and Vertical Milling. Boring, Drilling, Grinding, Planing, Slotting. Capstans :—Operating and Setting, including Screw Cutting, Face-plate Setting. Machine Tool Repairs, Inspection. **Experimental Shops :—** Machining from solid.

Note.—Under the National Service conditions prevailing in 1947 the training outlined above is condensed into about four years, ending at the age of twenty-one.

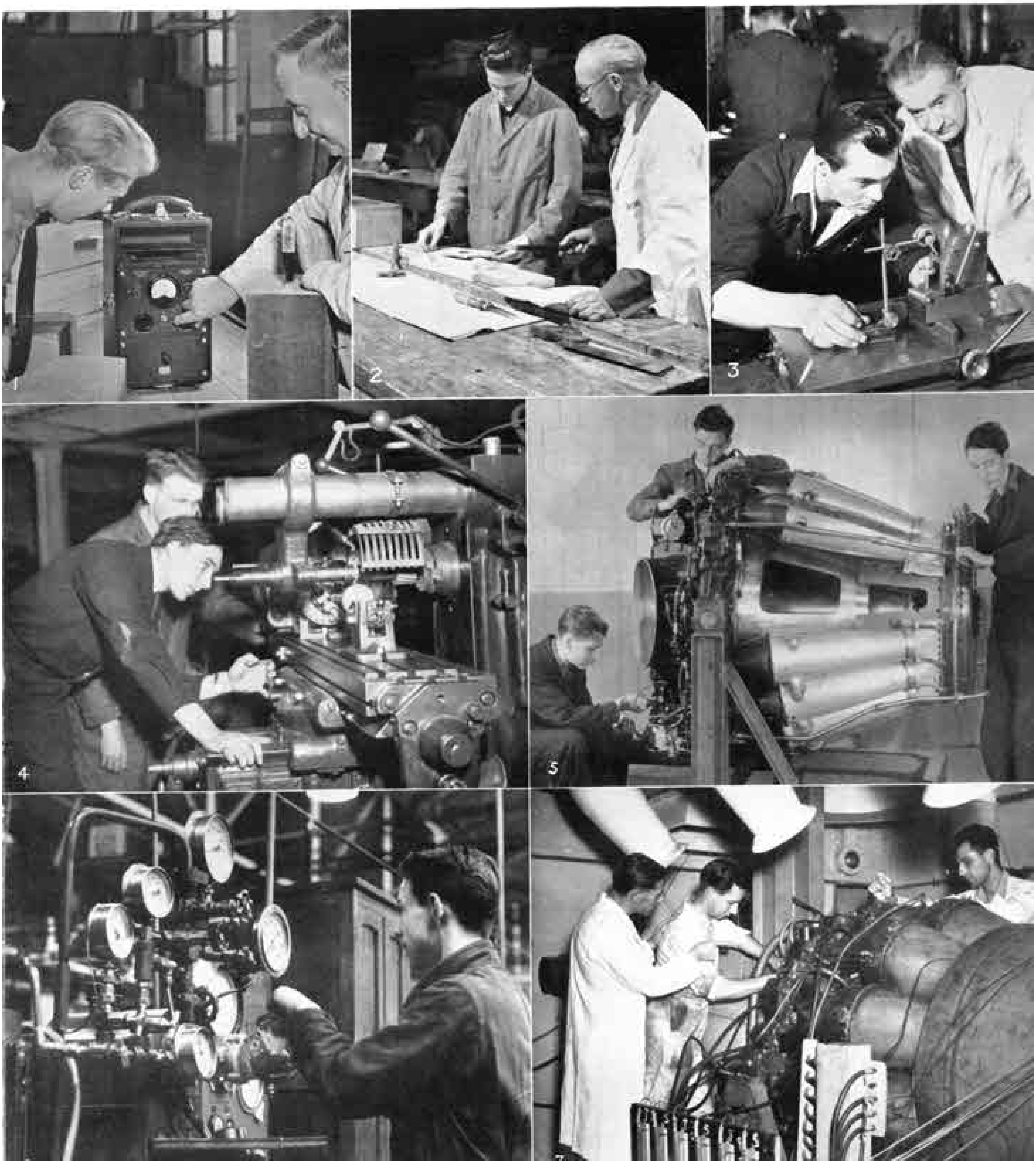
Figure Seven

PRACTICAL TRAINING

1. *Finishing a moulded former.* 2. *A girl apprentice upholstering a Dove seat.* 3. *Sheet-metal craftsmanship in the School workshop.*
4. *Apprentices on coppersmith work.* 5. *Acquiring machine-shop experience.*
6. *Casting a die for use on drop-hammers.* 7. *Routine laboratory work in one of the factories.*

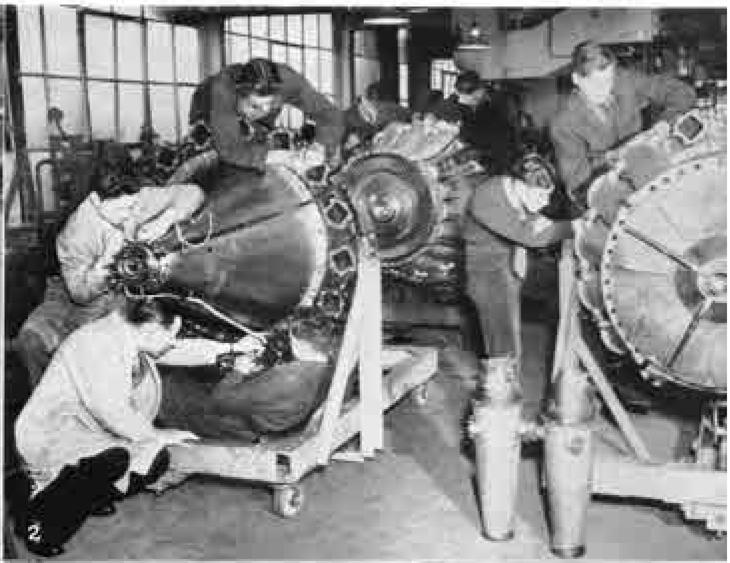
PRACTICAL TRAINING

1. *Testing wood for moisture content.* 2. *Early wood-working instruction.* 3. *Fine work in the machine repair section.*
4. *Milling instruction at Hatfield.* 5. *Preparing a sectioned jet engine for the R.A.F.*
6. *Testing a constant-speed propeller.* 7. *Installing a Ghost turbine for test.*



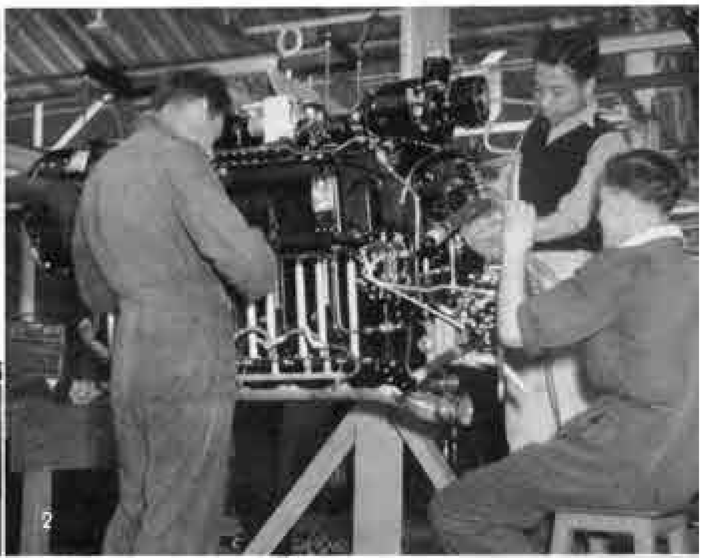
P R A C T I C A L   T R A I N I N G

1. *A woodworking class in one of the School shops.*
2. *Assembling Goblin jet engines.*
3. *Advanced technique in an Engine Company tool-room.*
4. *Precision measurement of propeller blade profile.*
5. *Drop-hammer work in the press shop.*
6. *Sheet-metal forming by the rubber-press method.*



PRACTICAL TRAINING

1. *Engine maintenance on a Hornet fighter.*
2. *Checking a new Dove engine.*
3. *Checking Dove electrical circuits.*
4. *Day-to-day maintenance on the Gipsy Major engine.*
5. *Engineering apprentices studying typical biplane structure.*
6. *Aircraft-engineer apprentices at a D.H. school of flying.*



WELFARE

BILLETING

It is necessary for parents to make their own arrangements for the billeting of apprentices. They will be assisted in this, so far as is practicable, by the welfare sections of the School and of the de Havilland companies to which they are attached, but unfortunately it is not possible for the School to accept responsibility for the finding of suitable accommodation.

A hostel has been maintained to provide a temporary solution to the problem in cases of difficulty and it may be possible to accommodate a new apprentice there for a short period while a more permanent living arrangement is being sought.

MESSING

Mid-day meals and other light refreshments are taken at any of the factory canteens and are available at low prices.

MEDICAL CARE

The Medical Officer, with a staff of trained personnel, is in touch with the conditions under which all apprentices live and work. In addition the School, as distinct from the works, has a First Aid and Welfare Section and the boys are encouraged to seek its advice freely. Those from overseas or otherwise separated from their parents particularly find this section helpful.

SPORTS AND RECREATIONS

Facilities are available for boys to participate in most outdoor games, and they are encouraged to take part in games which engender the team spirit. Playing fields are provided for Rugby and Association football, there are both grass and hard tennis courts, squash courts, a swimming-pool and a bowling green, all on the premises. There is also a gymnasium and there are regular classes in gymnastics and physical training under a qualified instructor.

There are many clubs and societies within the organisation covering such subjects as art, photography, music, amateur dramatics. All of these are open to trainees—indeed, apprentices are keenly welcomed into their membership and activities.

FLYING

The facilities for learning to fly, which were discontinued during the war, have been revived. The London Aeroplane Club, which has been associated with the de Havilland Company for a great many years, was recently brought under the wing of the Technical School and flying instruction is now available to apprentices at specially low rates. The club is based at Panshanger, a country aerodrome a few miles from Hatfield, and the aircraft employed (as at January, 1949) are Tiger Moths and Hornet Moths.

LIBRARY

An excellent general library, at which almost any book, technical or otherwise, can be obtained, is available on company premises, with reading rooms open to all who are under training. The engineering section covers all the technical subjects required whilst attending the School. Daily and weekly periodicals and other publications are provided in the reading rooms.

CLOTHING

The practical work is hard on clothing, even when overalls are worn, and each boy should be in possession of an old suit for this purpose.

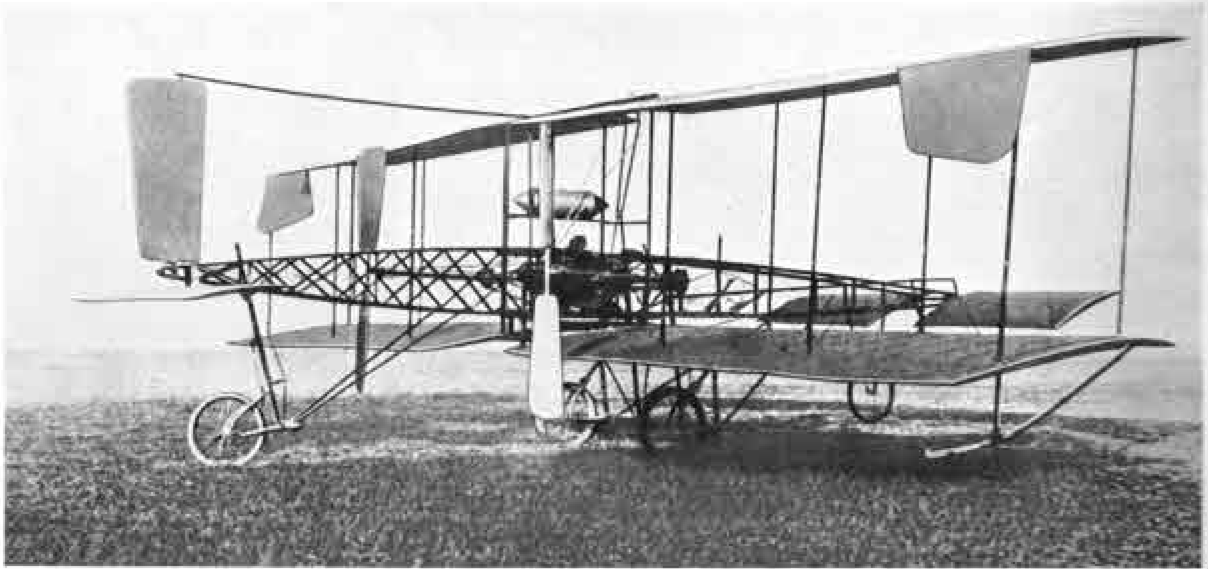
HOLIDAYS

During the first year of training boys have a short holiday at Easter and a Summer vacation of two weeks. Afterwards they take the same holidays as the factories in which they are working.

WELFARE

1. *Flying instruction at the London Aeroplane Club.*
2. *The swimming-pool at Hatfield Aerodrome.*
3. *A well-equipped factory surgery.*
4. *The Aircraft Company's library, general and technical.*
5. *A physical-training class at Hatfield.*
6. *Association football on the home ground at Hatfield.*

Chapter 6. AN OUTLINE OF DE HAVILLAND HISTORY



1908—1909. *The first de Havilland aeroplane.*

THE de Havilland Enterprise had its origin in the first attempts of Geoffrey de Havilland and Frank T. Hearle to build an aeroplane in 1908, although it was not until the period of the first great war that the team of young men came together which has directed the entire activities of the de Havilland Companies throughout their subsequent history including the remarkable years of the second war. The leadership has remained unchanged while the organisation has progressed to the position of responsibility which it now occupies. Sir Geoffrey de Havilland, who inspired the formation of the parent company in 1920, is its technical head to-day. He designed the four-cylinder, horizontally opposed, water-cooled engine for his first machine, in which it was so arranged that it drove through bevel gearing two propellers of which the aluminium blades were " adjustable as to pitch and as to twist." Mr. Hearle helped him to build this first machine, which was a pusher biplane, in a small building in Fulham from which it was conveyed on a lorry to a field near Litchfield and Highclere on the Hampshire Downs, close to de Havilland's home. On its first flight this aeroplane came to grief but without injuring its pilot, and the two men at once set about constructing around the undamaged engine an improved aeroplane with a single propeller, on which de Havilland successfully taught himself to fly in 1910.

This second machine was a stable and promising aeroplane, but the cost of the experimental work was high and, with their financial resources so nearly exhausted that the prospect of a return to motor-car engineering was before them, the two men accepted positions at the Government Balloon Factory at Farnborough and the aircraft was purchased as well. 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 British Army.

Early in 1914 he joined as chief designer Mr. Holt Thomas's company, The Aircraft Manufacturing Co.

1910. *The second de Havilland aeroplane, at Highclere.*

1914. *The D.H.1 two-seat fighter designed at Hendon.*

Ltd., at Hendon, where Farman biplanes were being built under licence. Before the war broke out with Germany in August of that year de Havilland was well on with the design of a two-seat pusher biplane fighter which was called the Airco D.H.1, and which initiated the series of type numbers that has been applied to all the aircraft built and projects investigated under his leadership to the present day. It was followed by a single-seat fighter, the D.H.2, which saw action against the Germans in France, then a twin-engined bomber prototype, the D.H.3, and, in 1916, a tractor biplane, the D.H.4, which was destined to make history. First appearing as a bomber with fighter performance, as did the Mosquito 24 years later, the D.H.4 was developed also for fighting duties, photographic reconnaissance and other functions, becoming a famous multi-purpose machine. In prototype form this aircraft was fitted with the B.H.P. 230 h.p. engine designed by Major Frank B. Halford, and an association then developed which has continued progressively throughout the subsequent years, so that to-day Major Halford is the Chairman and Technical Director of the de Havilland Engine Company.

It is often said that no aircraft did so much towards the defeat of Germany in the 1914–18 war as was done by the D.H.4 and the D.H.9 that was developed from it. The D.H.9 was another general-duty aircraft and had a long and successful career in the post-war Air Force. By October, 1918, Airco were building more than 250 aircraft per month, mostly D.H.9's, and they were at that time bringing into production the D.H.10 twin-engined bomber which had been developed from the D.H.3 for the long-range bombing of German industries.

One-third of the total Allied air forces, and 95 per cent. of the entire American production for the 1914–18 war, were aircraft of de Havilland design.

Some cross-Channel air services were operated in 1919, at first officially and later by commercial companies, using 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 de Havilland had in hand the design of an eight-seater cabin machine—

1916. *D.H.4's for the R.F.C.—bombers with fighter speed.*

1918. *General-duty D.H.9A's, built in large numbers.*

1918. *The D.H.10 for bombing German industries.*

1919. *D.H.4A's inaugurate the London-Paris airway.*

1920. *The D.H.18, improved airline equipment.*

1920. *The original "general offices" of the Company.*

1921. *The Stag Lane factory in its earliest days.*

1922. *The D.H.34 8-passenger European airliner.*

1926. *The D.H.50J after Cobham's famous flights.*

the first real attempt at a transport aeroplane—the Aircraft Manufacturing Company, of which he and his colleagues were employees, decided to close down their aviation department. Unable to believe that there could be no future in aviation, particularly on the civil side, de Havilland gathered around him a team of picked men from the Airco works and, again with Mr. Holt Thomas's help, succeeded in forming a little concern called The de Havilland Aircraft Co. Ltd.

This new company was incorporated on September 25, 1920, and moved into rented accommodation comprising a wooden office hut and a couple of sheds on Stag Lane aerodrome, Edgware. The hut, which served as the executive and general offices of the Company for some years, was later removed to Hatfield aerodrome where it now stands as a museum piece. The Design Department, which comprised Captain de Havilland and Mr. C. C. Walker, who had joined him at Airco in 1915, occupied a small room on the left of the unpretentious entrance. On the right was a little office from which Mr. Hearle controlled production—although the only work on hand at first was an order from the Air Ministry to complete two D.H.18 aircraft which had been started by Airco. Next to Mr. Hearle's office was a small room which Mr. F. E. N. St. Barbe, the Business Manager, shared with Mr. W. E. Nixon, the Secretary.

These men are still at the helm in 1949 and have with them a number of those fifty or sixty individuals who were chosen from the Airco factories to start up the de Havilland Company in 1920. Around them there has grown up over the subsequent quarter-century a team of high technical ability imbued with a rich tradition of its own. The strength and spirit of this body have developed largely as the result of a persistent endeavour to train correctly the young people entering the organisation and it is not surprising that some of the early apprentices occupy the highest executive responsibilities to-day.

From 1920 until Germany's second attempt at world domination the Company's activities were mainly concentrated in the building of aircraft for the civil

1927. *The Moth made private flying practicable.*

markets. The first few years were extremely difficult and it was the creation of a successful light aeroplane in 1925, the Moth, which gave the Company its first real chance. This led to overseas trade and the formation of the overseas de Havilland companies, and it brought the Company into the business of manufacturing engines. It enabled the concern to survive the world slump of the early 'thirties and led to the evolution of a line of light transport aircraft of unprecedented operational economy, which could pay their way without subsidy in the conditions of meagre and variable traffic which prevailed on the airlines that were being pioneered in all parts of the world up to the outbreak of war in 1939.

Within that broad outline of activity a few military aeroplanes were designed, although no great business was done with them, and some interesting high-performance aircraft were developed which, whilst inspired by sporting and competitive events, afforded valuable research and led to the clean high-speed aircraft of the second war.

Since it was the generation of a light and reliable engine that made the Moth possible in 1925, that effort of Major Halford's in conjunction with Captain de Havilland, as he then was, may truly be said to have founded the engine business which in 22 years of hard experience under Halford's technical direction, has produced the best light piston engines and been able to assume a leading position in the jet-engine field. Likewise it was the designing of the Comet racer in 1934 which brought home the need for a British production of variable-pitch propellers and led the de Havilland Company to build up a large-scale propeller manufacture in time for the struggle for air supremacy when the second war came upon us.

In the first few years of the Company its resources were extremely small and profitable business was hard to find. The Royal Air Force had been drastically curtailed and civil aviation was slow to develop. Until 1924 a de Havilland Aeroplane Hire Service was operated and from the first there was a de Havilland School of Flying, which acquired a little standing in 1923 when it

1927. *The King's Cup won by the Moth.*

1928. *The D.H.71 (Gipsy One) which did 187 m.p.h.*

1933. *The Dragon on Hillman's London-Paris service.*

1934. *The Comet at Melbourne—11,000 miles in 71 hours.*

1934. *Stag Lane celebrates the triumph of the Comet.*

1934. *D.H.61 on first scheduled Australia-England mail.*

1935. *Learning the new technique of propeller production.*

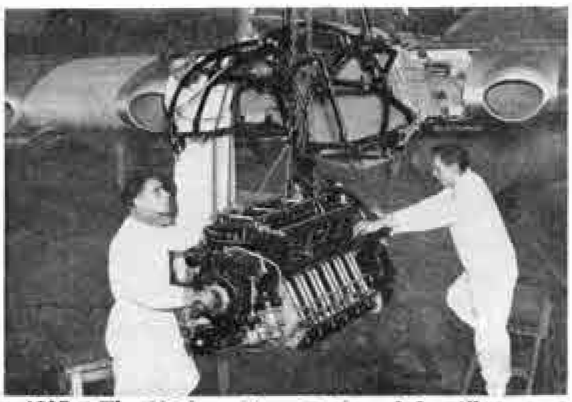
1935. *The D.H.86 early in its long and world-wide career.*

was appointed to take care of the reserve training of the R.A.F. The cross-Channel airlines competed manfully with the weather and with each other until it became necessary in 1924 to amalgamate the main British companies to form Imperial Airways. In these stringent circumstances the de Havilland Company produced biplane transports well suited to the current operating conditions. The D.H.18 led to the superior D.H.34 in 1922, an eight-seater with "cabin boy," and to the D.H.50 in 1923, a four-passenger machine which was the basis of the smaller internal operations, notably in Australia. Sir Alan Cobham made historic flights in this aircraft and already de Havillands were beginning to build a reputation for imaginativeness and for soundness of design and construction. In 1926 a successful three-engined transport, the D.H.66, was built for the Imperial route to the East.

All the time there was eagerness to produce a practical light aeroplane, and extremely small engines were tried in an effort to lower the cost; so de Havilland's decision to break away from this line of thought, and Halford's engineering of the Cirrus 60 h.p. engine from parts of the old 90 Renault made possible the Moth two-seat biplane trainer which virtually founded the light-aeroplane movement on a world-wide basis. The Moth first flew on February 22, 1925, and it was the forerunner of many open-cockpit and enclosed light planes which have led the way as trainers and tourers from that day to this.

Logically the Company soon found it necessary to build its own engines and thus the Gipsy range came into being in 1926–27, with a new shop at Stag Lane to manufacture them. In the first year of the Gipsy a high-performance aeroplane, the D.H.71, was designed for it and a world speed record of 187 m.p.h. was attained on 130 h.p. Club flying developed with the Moth and an era of remarkable flying achievements opened in which British skill and courage shone before the world. Many, many names could be quoted but the solo flight in a Moth to Australia which Amy Johnson accomplished in 19½ days in May, 1930, will be recognised as one of the finest of all those adventures

1936. *A Tata Dragon Rapide at Bombay airport.*



1937. *The 525 h.p. Gipsy Twelve of the Albatross.*

which did so much to establish Britain's strength in the air from both civil and military points of view.

While the trade slump of the early 'thirties was still retarding progress in many fields the de Havilland Company contrived to develop light transports from the example of the Moth, indeed using the same Gipsy engines and some of the airframe components. There was highly successful business in these categories, typified by the Dragon of 1932, throughout the years up to the war, and the Dove, which was the Company's first post-war aircraft, continues the light-transport tradition in the formula of the large modern airliner.

The England-Australia Race in 1934 made another strong appeal to the sporting instinct latent in the Company which forthwith created a small two-seat twin-engined racer and got it on the line for the race in a matter of nine months. This aircraft, the Comet, outclassed American airliners developed under favourable commercial conditions and flying in the race along their accustomed trade route. It was the first British aircraft to have variable-pitch propellers, wing flaps and retractable undercarriage.

The reluctance of the British and Dominion Governments in those days to encourage civil aviation in any way that might savour of concealed militarism, however unjustifiably, put the British industry at a disadvantage and it was not until 1936 that the de Havilland concern was able to obtain an order for a transport aircraft which, profiting from the valuable lessons learned with the Comet racer, would set out to obtain economy by speed achieved through clean aerodynamic form. This was the Albatross 22-seater. Its development and that of the smaller Flamingo liner of 1938 were thwarted by the war, but the Company was meanwhile gaining in technical strength so that the war, demanding the full exertion of its abilities, afforded it a notable opportunity of expression. The overseas de Havilland companies had been maturing at the same time and provided a ready-made productive organisation for global conflict.

The Mosquito multi-purpose aircraft was the company's foremost contribution to the struggle. Nearly 6,000 of this type were built by de Havilland in England,

1939. *Tiger Moths and the new Moth Minor.*

1939. *The Flamingo, on the London-Jersey service.*

1943. *The versatile Mosquito of the 1939–45 war.*

1938. *The Albatross, London to Paris within the hour.*

1944. *The Vampire, most practical jet fighter.*

1944. *Sea Hornet, high-performance naval fighter.*

1945. *First naval jet aircraft.*

Canada and Australia during the war, and it was the fastest aircraft on any front from September, 1941, until early 1944. Nearly 4,000 Tiger Moth trainers and some 2,000 other aircraft were turned out, also 10,000 Gipsy engines and 140,000 propellers, not to mention vast quantities of repair work. From the Mosquito a long-range fighter, the Hornet, was evolved, but the collapse of Japan in 1945 came before it could show its operational capabilities. It was the last and finest propeller-driven combat aircraft.

From 1941 the Company was engaged in the design of a gas-turbine jet engine and a fighter aircraft, the Vampire, to be powered by it. The Company was the first of the established builders of aero-engines in Great Britain to enter the field of jet propulsion, and it enjoyed from the first a technical advantage in that its organisation embraced the design of both aircraft and engine, as it were, under one roof. The Vampire aircraft and the de Havilland jet engines quickly attained success, having been adopted by British, Dominion and foreign Governments, and it becomes increasingly clear that this co-ordination of technical development as between the aircraft and the power unit is of profound significance.

The war-time manufacture of Mosquitoes and other aircraft strengthened the overseas de Havilland companies and it is not surprising that since 1945 both the Canadian and the Australian companies have embarked upon aircraft designs of their own. The first Canadian product is a trainer, the Chipmunk, designed to replace the Tiger Moth, and the second, flying by August 1947, is a single-engine light transport for Canadian bush operations. The overseas organisation has no parallel elsewhere in the industry.

As to the present position and outlook of the de Havilland Enterprise, it is likely that its interests will continue to be widely spread both technically and geographically. It is occupied with military aircraft of the highest performance. Its current combat aircraft are developed also for naval use ; indeed, the Mosquito and Hornet are the first multi-engined types ever to operate from a ship at sea, and the Vampire is the first jet aircraft ever to do so. The Enterprise retains its interest in small and large transports and has recently undertaken as a national responsibility the building of a jet-propelled Atlantic airliner which will virtually double the speed of travel at a single step. The concern for the light-aeroplane movement is retained. In jet-engine and piston-engine developments and in propellers a leading position is held.

Briefly, the Enterprise constitutes the only creative builder of aircraft, turbine and piston engines and propellers to occupy a place of eminence in both civil and military fields and to possess full-scale manufacturing establishments in three continents and a world-wide servicing organisation of long standing.

1945. *The Dove, first post-war civil design.*

1949. *Chipmunk, the new R.A.F.V.R. trainer.*

◀ 1948. *D.H. 108, closed-circuit record 605.23 m.p.h.*

1948. *Ghost Vampire,* ▶ *height record 59,446 ft.*

◀ 1948. *Canadian Company's Beaver bush transport.*

1948. *Australian Company's* ▶ *Drover utility transport.*

A FEW FACTS AND FIGURES CONCERNING THE DE HAVILLAND TRAINING SYSTEM

1. The School was inaugurated in 1928 to add theoretical instruction to the existing trade apprenticeship training.
2. Besides thousands of skilled craftsmen the School has turned out in twenty-one years some 1,700 certificated engineers.
3. At present the School has about 950 apprentices under training. Of these 536 are trade apprentices training to be skilled craftsmen and 307 are engineering apprentices training for diplomas.
4. Trade apprentices are upgraded to engineering apprenticeship by yearly selection according to general merit and progress.
5. Ten de Havilland scholarships for the engineering apprenticeship are awarded each year to new entry.
6. A third category of trainee is the university graduate. A limited number are accepted annually for post-graduate courses and practical experience.
7. The duration of the course, for engineering and for trade apprentices, is at present four or five years.
8. Apprentices train in either aircraft or engines or propellers. In each of these divisions there are courses, aimed at careers on the design side, the production side and the maintenance side.
9. The qualifying examinations for which engineering apprentices are trained are :—
   Associate Fellowship of the Royal Aeronautical Society.
   Graduateship of the Institution of Production Engineers.
   Air Ministry Aircraft Engineers' Licences.
   National Certificate—Mechanical, Production, Electrical, Metallurgical and Aeronautical.
   Higher National Certificate.
   In special cases, B.Sc. (Eng.) or B.Sc.
10. In the School year September, 1947, to August, 1948, the following examination passes were obtained :—

Royal Aeronautical Society	11 completed their Diploma 34 partly completed
Higher National Certificate (Mechanical and Aero) ...	15
National Certificate (Mechanical and Production)	29
B.Sc. (Eng.) Final	1
B.Sc. (Eng.) Intermediate	3
Institution of Production Engineers	11
Air Ministry Licences A	10
C	8

   In comparison with last year the total reaching the final stages has grown and the forecast for next year is still a larger number in each section for the diploma stage.

11. The first year of training, for both grades of apprentice, is basic and is conducted in School workshops, of which there are three, located at Hatfield (aircraft), Edgware (engines) and Bolton (propellers).
12. Class work for engineering apprentices occupies one or two days per week, and in later stages one or two evenings as well.
13. All classes are recognised by the Ministry of Education.
14. Fifty per cent. of the engineering apprentices attend technical colleges in London, the Home Counties or Lancashire for academic subjects.
15. Apprentices are drawn from all types of school in Great Britain, and from the equivalent of public schools overseas. Selection at entry is competitive.
16. Only a small percentage of those applying from overseas can be accepted. At present about 26 out of 307 engineering apprentices are from overseas.
17. The staff comprises 31 whole-time lecturers and instructors, and 25 part-time lecturers and instructors.

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MR. C. R. BURGESS ...	Sales Manager, Hatfield.
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MR. P. WITT... ...	Executive Engineer, Lostock.
MR. G. S. CHAMBERS	Personnel Manager, Hatfield.
MR. K. W. CLARKE...	Chief Metallurgist to the Enterprise.

SCHOOL STAFF

PRINCIPAL

SQDN/LDR. R. W. REEVE, D.F.C., A.F.C., M.M.

CHIEF EDUCATION OFFICER

MR. G. M. SAUL-BROWN

BUSINESS MANAGER

MR. J. C. COLLETT

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MR. W. BLACKBURN	MR. W. WATFORD	MR. W. RUSHDEN

LECTURERS

Name	*Qualifications*	*Subjects Taught*
Mr. G. L. Aitchison		Day Continuation School, Maths. and Mechanics.
Mr. S. Birchall		Workshop Technology
Mr. D. G. Brown	B.Sc., D.I.C.	Aerodynamics.
Mr. R. W. Bundock	B.Sc.	Aerodynamics.
Mr. S. H. Collingwood		Metallurgy.
*Mr. H. Craig	A.M.I.M.E.	Drawing Pract. and Mechanics.
Mr. J. R. Eddowes...	M.A.	Maths.
Mr. L. A. C. Coombs	B.Sc., A.F.R.Ae.S.	Maths.
Mr. C. F. Elliott	B.Sc. (Elect.)	Electricity and Magnetism.
Mr. J. Grant	C. and G.	Physics.
Mr. R. M. Hare	A.F.R.Ae.S.	Structures.
*Mr. E. J. Mann	A.I.M.E., A.R.Ae.S.	Drawing and Design.
*Mr. L. Marvin		Workshop Practice.
*Mr. P. E. Mead		Workshop Practice.
Mr. R. H. Millhouse		Jig and Tool Design, Production Planning.
Mrs. C. E. Munting	Qualified Teacher (Pitmans)	Shorthand.
Mr. D. G. Murkett...	B.Sc. (Eng.)	Internal Combustion Engines.
Mr. M. Nixon		Production Planning.
Mr. R. Noble	A.F.R.Ae.S.	Structures.
Mr. G. W. Rengert...		Factory Organisation, Commercial Practice.
Mrs. W. Skeats		Typing.
Mr. A. P. Stewart	A.F.R.Ae.S.	Drawing Practice.
Mr. J. G. Strong	B.Sc., A.F.R.Ae.S.	Aerodynamics.
Mr. G. W. Weeks	A.I.M.	Metallurgy, Aircraft Materials.
Mr. J. R. Wesson	B.Sc.	Physics.
Mr. F. Wright		Workshop Technology.
*Mr. H. D. Wright		Aircraft Maintenance.
*Mr. H. Hart	A.M. Licences	Aircraft Maintenance.
Mr. J. S. Brown	B.Sc., A.I.M.	Metallurgy.
*Mr. G. A. Fresher		Workshop Practice.
Mr. G. W. Paget	A.I.M., C.G. (M)	Metallurgy.
*Mr. L. Rolfe		Internal Combustion Engines, Workshop Practice.
Mr. J. Smith		Jig and Tool Design.

Note :—Those marked * are also Instructors in the School on practical work.

INSTRUCTORS

Name	*Section*	
Mr. W. N. Honeywood	In charge of Engine Workshops (Stag Lane)	
Mr. A. Ayre ...	... In charge of Aircraft Workshops (Hatfield)	
Mr. E. D. Cant	... Sheet Metal Section	(Hatfield)
Mr. J. W. Brogan	... Machine Section	(Stag Lane)
Mr. J. Clapham	... Fitting ,,	(Hatfield)
Mr. R. H. Cobb	... Woodwork ,,	,,
Mr. J. Croswell	... Fitting ,,	(Bolton)
Mr. F. W. Chamberlain	Woodwork ,,	(Hatfield)
Mr. A. F. R. Duffey ...	Fitting ,,	,,
Mr. F. C. Dutch	... Machine ,,	,,
Mr. J. Daws ...	... Engine Section	(Stag Lane)
Mr. E. A. Fresher	... Machine ,,	,,
Mr. A. Hughes	... Fitting ,,	,,
Mr. A. Lake ...	... Machine ,,	,,
Mr. L. Marvin...	... Fitting ,,	(Hatfield)
Mr. P. E. Mead	... Machine ,,	,,
Mr. J. McIntyre	... Machine ,,	(Bolton)
Mr. A. E. Mitchell	... Drawing Office	(Stag Lane)
Mr. S. J. Oaten	... Fitting Section	(Hatfield)
Mr. H. Oliver ...	... Fitting ,,	,,
Mr. H. C. Sheather	... Machine ,,	(Stag Lane)
Mr. W. C. Young	... Engine ,,	,,