(1) Case 4/2/50

Secst. E-27—60,004—17-11-48.

E & P.H. Dpt. (194 9) Department.

SERIES.

G.O. NO. 3666 Edn.

Dated 29-11- 1949.

(22)

[Despatch Abstract.]

Technical Education- Post graduate and apprenticeship Trg. Scheme of the Hindustan Air craft Ltd.- Prospectus / Syllabus for- Papers recorded.

Back Papers.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

Further Papers.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

VS

HINDUSTAN AIRCRAFT LTD.,
BANGALORE.

63014

2

ASSISTANT SECRETARY TO GOVERNMENT
15 JUN 1949
DEPARTMENT

AE/ 120

June 1, 1949.

Labour Ministry,
M A D R A S.

Dear Sir,

We are taking the liberty of enclosing a copy of our Prospectus/Syllabus for our post Graduate and Apprenticeship Training Schemes.

The training is designed to produce in the course of 2 years in the case of the Post Graduate Training, and in the course of 3 years in the case of the Apprentices, fully skilled Aeronautical and Mechanical Engineers and Production Engineers, and on the other hand, fully skilled technicians and craftsmen for aeronautical and allied industries.

We trust that the Prospectus/Syllabus will be of interest and that if you can find the time after perusal, you would be so kind as to give us your comments if any.

Dev. DI
Encl No/63014-D.I/49- 1 -6-49.
Forwarded to the D.I&C.
15/6/49.
LA.
To The D.I&C. (with enclo. in original) put up below

Yours faithfully,
FOR HINDUSTAN AIRCRAFT LTD.,

L.Maxwell,
Chief Production Engineer.

2/ A/ Dev (DI)

To AS

E+PId U.O.

× E&PI Have Concerned with Aeronautical Engineering & Apprentice Ship etc.

17.6.49.

SECRETARY TO GOVERNMENT
21
46964
EDUCATION & PUBLIC HEALTH DEPT

Dev dept no. 10/63016-D. I/49-1
17.6.49

The prospectus may perhaps be sent to the D.P.-9. for remarks. A draft memo is submitted for approval.

23.6.49.

approved draft

E.P.H.(A) 3 3

Memo. No. 46964-1/49A Edn Dated 24-6-49.

Sub: Hindustan Aircraft Ltd., Bangalore-Prospectus Syllabus for its postgraduate and Apprenticeship Trg.

From the Hindustan Aircraft Ltd., Bangalore.
AE/120 dated 1.6.49.

A copy of the letter from the Hindustan Aircraft Ltd., Bangalore, read above together with a copy of the Prospectus/Syllabus referred to therein is forwarded to the D.P.-9. for remark if any at an early date.

23.6.49

23/6/49

24/6/49

To the D.P.-9.
(with copy of l.c.f. and the prospectus in duplicate to be retd. with reply)

28/6

E.P.H.(A)

Memo. No. 46964-2/49A Edn. dated 16-9-49.

Sub: Hindustan Aircraft Ltd., Bangalore - Prospectus/syllabus of courses post-graduate and Apprentice ship Trg.

Ref: Memo. No. 46964-1/49A Edn. 2.24.6.49

The D & G. is requested to expedite his reply to the memo cited above.

To the D.P.G.

14.9.49

OM
15/9/49

POST COPY OF THE TELEPHONIC MESSAGE DATED 8.10.49.

A/ 5 K 7

From
The Director of Public Instruction,
MADRAS.

To
The Secretary to Government,
Education and Public Health Department
Fort St. George, MADRAS.

Ref: Government Memo. No. 46965-1/49-A Education dated 24.6.49 regarding Hindustan Aircraft Limited, Bangalore - Prospectus and syllabus for Post-Graduate and Apprentice Training.

****

A reply will be submitted on receipt of remarks from the Principal, Engineering College, Guindy who is being reminded to expedite his reply in the matter.

for Director of Public Instruction

M.B. 10.10

The D.P.I. may be reminded next on 27.11.49.

12.10.49.

(1) Two seats be reserved for Ceylon for which that Government makes recommendation. In view of the fact that many Indians have recently returned from Ceylon, who on account of their nativity are ineligible for selection from the district and regional quotas, it is for orders whether two seats should be reserved for Indians repatriated from Ceylon.

(2) The two seats reserved for the Cochin State since the merger of that State with Travancore, which has a College of its own, it is for orders whether the reservation should be continued in view of the fact that the merger has only taken place recently and it is possible that nominations have been made before the merger.

(3) Whether representation for Hyderabad which was specially given with reference to the extraordinary condition prevailing last year, should be continued.

(4) Whether one seat each in Vishakpatnam and West

Education Department

From

The Director of Public Instruction,
Madras.

To

The Secretary to Government,
Education and Public Health Department

RcNo. 917 K2/49 dated 29-10-49

Subject: Hindustan Aircraft Ltd., Bangalore - Prospectus and Syllabus for Post Graduate and apprentice training

Reference: Government Memo No. 46964-1/49-A Edn. dated 24-6-49 and this office Telephonic message dated 8-10-49

--

I have the honour to enclose herewith a copy of the letter Rc. No. 60 B/49 dated 25-10-49 from the Principal, College of Engineering, Guindy, containing his remarks on the prospectus and syllabus for Post graduate and Apprentice Training sponsored by the Hindustan Aircraft Ltd., Bangalore and state that I agree with the Principal.

The prospectus in original is returned herewith.

Yours faithfully,

for Director of Public Instruction

Vk 31.10
Enc:

Copy of letter Rc.No. 60 B/49 dated 25-10-49 from the Principal, College of Engineering, Guindy.

--

Sub: Hindustan Aircraft Ltd - Bangalore - Prospectus and Syllabus for post graduate and apprentice Training

Ref: Director of Public Instruction's proceedings Rc. No. 917 K2/49 dated 2-7-49 and post copy of the Telephonic message dated 8.10.49

I have gone through the prospectus and syllabus furnished by the Hindustan Aircraft Ltd., in detail and submit the following remarks on the same.

The scheme for practical training drawn up by the Hindustan Aircraft Ltd., for post-graduates and trade apprentices has been very comprehensively drawn up in all its details. It is expected that Graduates and trade apprentices will take advantage of the same and with the respective training, be in a better position to enter into services in an aircraft factory or any other industrial organization than it has been possible for them to do so up to the present time. Facilities for practical training have been given to students of various categories in workshops owned by the Government and other private firms but no attempt has been made to draw up a regular scheme for the same. It is presumed that the Hindustan Aircraft Ltd., has got the necessary staff for ensuring that the training is carried out in all its details as specified in the syllabus.

The scheme for the graduates' training is dividied into two sections, the first year in practical work, where a graduate will supplement the knowledge that he has obtained in his Engineering institution by the work that he will have to do in the various departments. In the second year his theoretical knowledge, that he has obtained in the institutions has further opportunities of being developed in the work that has been planned in the design office, drawing office and other departments. The scheme is therefore comprehensive for the graduates.

The trade apprentice course will develop young men with suitable qualifications and experience into skilled technicians, which is so wanting in the whole of the Indian Union to man important industries. Skilled technicians that are available all over India are those who have learnt their trade by mere experience but have not been guided into right methods of getting this skill by a recognised form of training. During the last war the Technical training Scheme instituted by the Central Government has brought into the field many young men and has given them the initial training to make a very good skilled technicians. The scheme contemplated by the Hindustan Aircraft Ltd., is considered a very important step in the right direction and deserves encouragement. The scheme for the trade technicians' course covers a period of 3 years and 3 years are considered necessary if the technicians are to be well on their way to acquire real skill in the various trades.

As pointed out at the outset, very few workshops or industries have got facilities for graduates and licentiates to undergo practical training in an organised manner, which will supplement the training that they have received in their institutions, polytechnics and other trade or occupational schools. The scheme contemplated by the Hindustan Aircraft Ltd., should be taken as an example and every industry in the Indian Union should adopt a similar form of training. It is expected that if the Apprentic Bill comes into law in this province such facilities must be offered by every industry or workshop that is satisfactorily functioning in this province.

/True copy/

for Director of Public Instruction.

12

Memo. No. 46964-3/49 A Edn. dated 5-11-49.

Sub: Hindustan Aircraft Ltd., Bangalore - Postgraduate and Apprenticeship Trg. Schemes - Prospectus/Syllabus for.

Ref: your No. 917 k_2/49 d. 29-10-49.

The Prospectus/Syllabus (the D.P.I's letter) said to have been returned with ~~your~~ cited has not been received. The Director is requested to return it urgently.

6/4-11-49 Asst 5/11/49.

Asst 5/11/49

To the D.P.I.

7 1 13

M6 8/11

P 9 c/f

14 not to issue
I draft

E.PH.(A)

Letter No. dated -.11.49.

Copy to the D.P.I., w.r.t. his No. 917 K2/49 d. 29.10.49.

p9 c.f.

To The Chief Production Engr.,
Hindustan Aircraft Ltd.,
Bangalore. (with copy of p11 c.f.)

Sir,

Sub: Postgraduate and Apprenticeship Trg. Schemes of the Hindustan Aircraft Ltd — Prospectus/Syllabus for.
Ref: Your letter No. AE/120 d. 1.6.49.

p1 c.f.

W.r.t. your letter read above, I am to forward herewith for your information a copy of the letter No. 60 B/49 d. 25-10-49 from the Principal, Engg. College, Guindy, containing his remarks on the Prospectus/Syllabus for your Post-Graduate and Apprenticeship Trg. Schemes.

Yours faithfully,

p11 c.f

6/11/49.

P.T.O.

15 K.

Post Copy of the Telephonic Message No.917 K2/49 dated 15.11.49.

From
The Director of Public Instruction, Madras.

To
The Secretary to Government, Education and Public Health Department, Fort St. George, Madras.

*****

SECT. SECRETARY TO GOVERNMENT
18 NOV 1949
EDUCATION AND PUBLIC HEALTH DEPTT.

REF: Government Memo. No.46964-3/49-A Education dated 5.11.49 regarding Prospectus and Syllabus for Apprentice Training Scheme of Hindustan Aircraft Limited, Bangalore.

....

The copy of Prospectus and Syllabus is submitted herewith.

FOR DIRECTOR OF PUBLIC INSTRUCTION.

MB 16.11

16/11/49

16.

DSME Pune
24/11

Copy to the D.P.O., W.R.T.
his No. 9176/49 d. 29/10/49.

plc/f

28/23/11

17/E.P.H.(A)

Letter No. 46964-4/49A Ed dated 22-11-49.

To The Chief Production Engr.,
Hindustan Aircraft Ltd.,
Bangalore (with copy of plc/f)

Sir,

Postgraduate and Apprenticeship Trg. schemes of the Hindustan Aircraft Ltd. Prospectus/Syllabus for

Ref: Your letter No. AE/120 d. 1.6.49.

W.R.T. your letter cited, I am to forward herewith for your information a copy of the letter No. 60 B/49 d. 25-10-49 from the Principal, Engg. College, Guindy, containing his remarks on the Prospectus/Syllabus for your Post Graduate and Apprenticeship Trg. Schemes. Yours faithfully,

plc/f

19-11-49 Bgy 25/11/49 DM 26/11/49

18

The draft overleaf has been issued. The papers may be recorded.

25-11-49

25/11/49

Abstract

Tech'l. edn. — Post-graduate & apprentice-ship Trg. Schemes of the Hindustan Aircraft Ltd. — Prospectus/Syllabus for — Papers recorded

G.O. 3666 Edn.
29-11-49

10

Hindustan Aircraft Ltd., Aeronautical & Technical Training Schemes

HINDUSTAN AIRCRAFT LTD.

PROSPECTUS/SYLLABUS

FORM No. HAL/ATO/5.

FOREWORD

This prospectus/syllabus outlines the HAL training organisation designed to supply the aeronautical and aviation industries in India with the much needed technical and professional personnel. The science of aeronautics is making rapid advances particularly so in India where manufacturing and operating sides of the industry stand ever in need of technicians, especially men with production and engineering qualifications.

The training of University Graduates entering the HAL scheme for training as aeronautical engineers is outlined in Chapter I, pages 2 to 4.

The training of younger people entering the HAL scheme for Trades Apprenticeship Training at different educational levels is outlined in Chapter II, pages 5 to 7.

The syllabus of training of Graduates in aeronautical engineering is given on page 8 Chapter III, and the syllabus of training in the Trades Apprenticeship is given on page 14, Chapter IV.

The principle of conducting practical and theoretical training, under both the schemes is briefly but clearly described and illustrated by various pictures. The closing Chapter (Chapter V) of the prospectus/ syllabus gives an indication of Apprentice' welfare, living quarters, medical and sports facilities, and commences on page 20.

The organised training of young men at varying educational levels to fit them for occupations and professions within the Aeronautical and Aviation Industries was first conceived by the Hindustan Aircraft Company in 1947.

The syllabus is designed to provide a comprehensive course of theoretical as well as practical workshop training. Thus a grade of Engineering Apprentices and Aeronautical Engineers will come into being, trained to become fully qualified for all branches of the industry.

Although by no means a matter of policy, it is quite natural that a growing enterprise such as the Hindustan Aircraft Company Ltd. will absorb a large proportion of the young men trained under the scheme. Many, however, will go out to other sections of the industry: to other Aeronautical Engineering Factories, which will inevitably "grow up" throughout the country. Many will find careers in the operating side of the industry or, as it is more familiarly known, in Aviation. Again it is possible that some will find appointments in Government service, with the Directorate of Civil Aviation and, in a civilian capacity, perhaps with the Technical Research and Development Branches of the Air Force.

With an ever expanding military and civilian Air Force and with an expanding Directorate of Civil Aviation to cope with the legislature necessitated by an expanded Air Service, technical instruction to young men with an Aeronautical bent must increase beyond all previous experience and opportunities for advancement will naturally follow.

SYNOPSIS

Broadly speaking, the practical and technical training schemes introduced by HAL may be divided largely into two specific grades:—

(1) An Advanced training, designed to develop the experience of the University Graduate and fit him for an appointment in a professional capacity in the Aeronautical Industry.

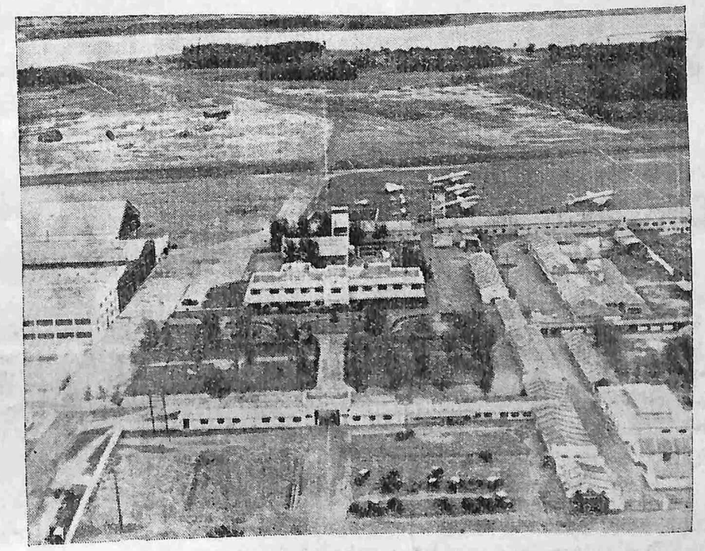
and (2) A Trade Apprenticeship Training Scheme, designed for the practical and Technical training of somewhat younger men with perhaps a lesser standard of education to become Supervisors, Assistant Supervisors and the all-important skilled man, upon whom the very backbone of a Production Organisation is supported.

It is necessary therefore, for purposes of clarification to divide the Prospectus into two parts.

"THE GRADUATE"

AND

"THE TRADE APPRENTICE"



Aerial View — "Headquarters" and part of main factory

CHAPTER I

THE GRADUATE PROSPECTUS

Ever since the famous Wright Brothers concluded the first successful flight of a "heavier than air" craft, the aeroplane has without doubt constituted the most complex product of modern Engineering Science.

Nowadays the complexity of the modern aircraft is almost unbelievable. Specific requirements of safety, of speed, designing for a pre-determined purpose, of carrying ever-heavier loads at higher altitudes and with greater economy continue to increase this inherent complexity.

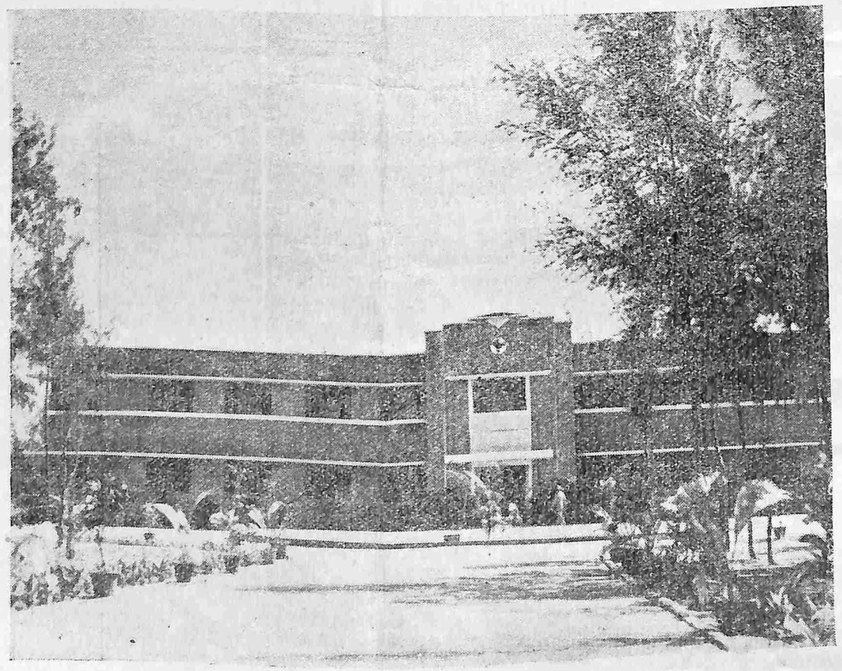
Worldwide expansion of Aviation, both civil and military, has inereased the scope of the industry tremendously during the past 10 years.

The introduction of "Reaction," as a motive force, has even further increased the scope. Therefore, there are correspondingly tremendous opportunities, within the Aeronautical Industry as a whole, for the Engineering Graduate.

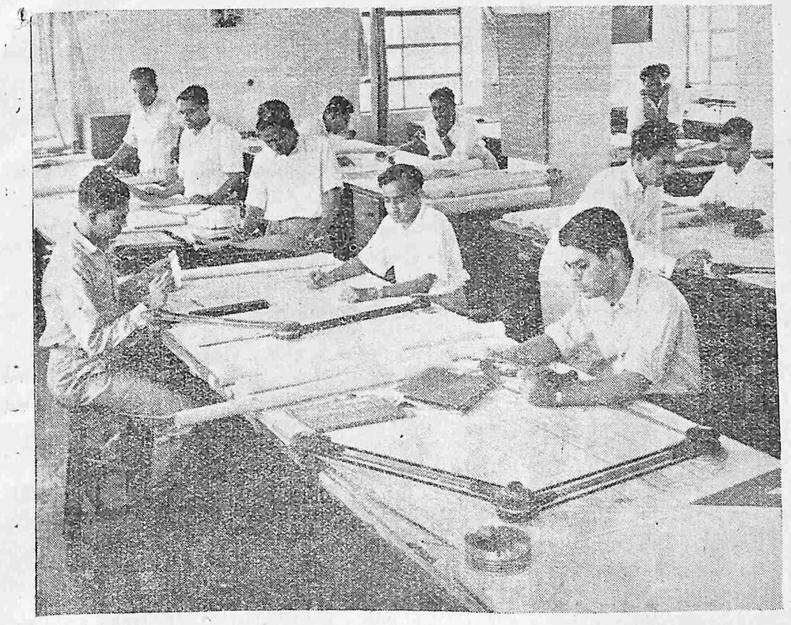
The very industry itself cannot exist without the University-trained men. Their background and mental attitude is normally more academic than practical and the tendency is for them to become absorbed into the Laboratories, Aerodynamic, Stress and design Departments of the industry.

Of the 4 technical phases mentioned, the Design aspect is quite naturally much larger in size and scope and as a rule demands a greater degree of practical training. On the technical production side, there is also an ever-increasing demand for the Engineering Graduate with a practical bent.

In the main, the purely research worker for the Laboratory, the Aerodynamycist and the Stressman and prehaps to a lesser extent the Designer are clearly specialists confining themselves to their particular sphere.



"Operations Control".



Sectional view of Drawing Office

The highly trained "Production" Engineer, however, must be trained to a certain extent in almost every phase of Aeronautical Engineering. He must know something of the Stressman's difficulties, of the requirements of the "Research worker." He must know even more of the "Designer's" difficulties. Drawing office and "shop" experience are an essential. He must also know a little of the intricacies of economics, of Accountancy, Stores Procedures and control of bonded materials. Of paramount importance, however, he must be well versed in Design Economics and the multifarious phases of Production Control by "labour cost allocation" against specific operations and manufacturing methods.

Engineering Graduates, accepted for training under the HAL Advanced Training Scheme, will for the purposes of record, be requested to write a "paper" outlining their particular preference. The first phase of their training will be almost entirely practical and during this period the questions inter alia, that they might ask during lectures will be closely observed and their initial preference will be compared with the observations of the senior factory technicians. Therefore, by an equable process of preference and selectivity, Graduates will be trained finally in the professions they prefer and to which they are most suited.

The total period of training under the Advanced Training Scheme extends for two years, commencing in July of each year. Thus after the expiry of the initial two years, there will be a regular annual outflow of trained men ready to take their place in one professional capacity or another in the industry.

The first year of the two year period is given over entirely to the practical side of the Graduate's training and is compulsory. During this first year, he will be methodically trained in the Basic Principles of :—

Foundry work.
Precision Machine Shop work.
Welding of both Ferrous and Non-ferrous metals.
Heat Treatment.
Sheet Metal Work.
Finishing and Plating.
Tool Design and rudimentary lofting.
Sub-assembly work.
Aircraft Final Assembly work.
Engine Overhaul
and Development and Experimental Department.

After the first three months of the Graduate's practical training, he may, should he prefer later to specialise, spend his remaining Practical training time in any one of the Factory Branches mentioned above.

At the conclusion of the first year, all graduates will be required to pass a "Practical" test, arranged and supervised by highly skilled technicians and craftsmen.

His initial professional preference, technical observation of his capabilities and suitabilities and the result of the examination will decide, on an equable basis, the specialised training which will be given to him during the second year.

Training in the second year will be offered in any one or all of the following departments :—

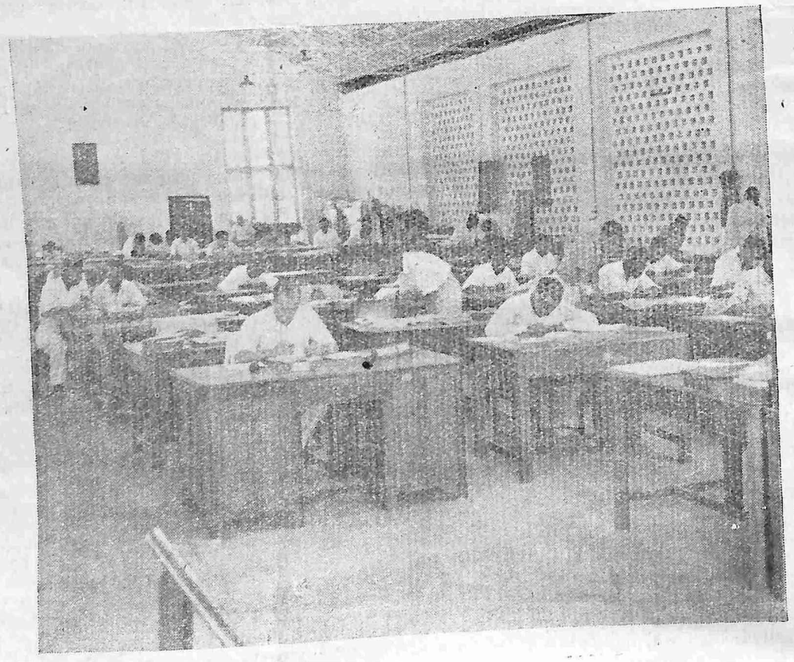
(1) Prototype Aircraft Design, or Projects, as it is more familiarly known.
(2) Drawing Office.
(3) Stress Office.
(4) Aerodynamics Office.
(5) Research and Experimental.
(6) Sales and Commercial.
(7) Planning and Ratefixing.
(8) Production Engineering.

Brief as it is, this broad outline of the scheme for training university graduates to become professional Aeronautical Eugineers, nevertheless illustrates quite sufficiently the aims and benefits not only to prospective university graduates but to the Aeronautical Engineering Industry as a whole.

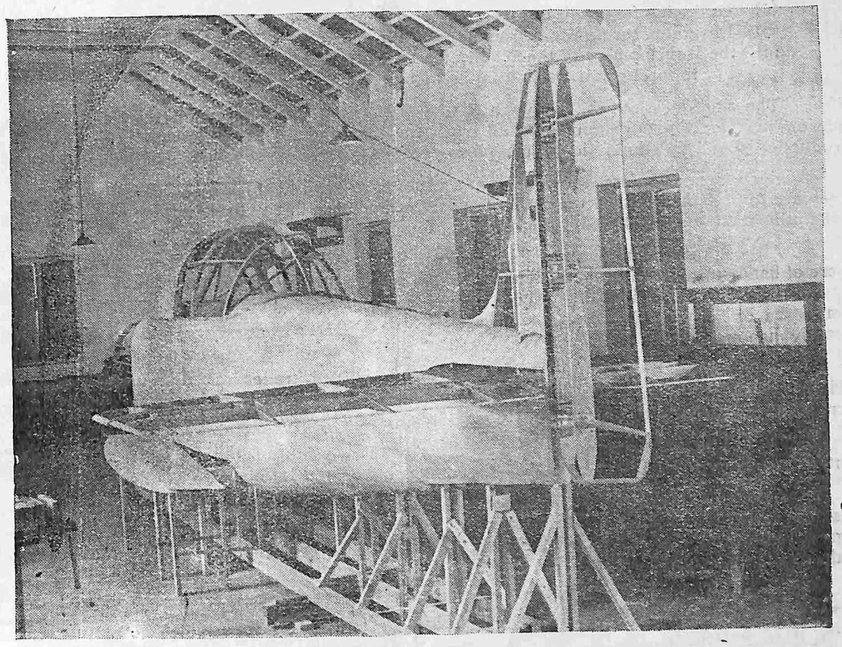
It is the Company's intention to offer to the university graduates trained under this scheme, the greatest possible freedom of choice of profession and substantially the only part of the overall training that is made mandatory by the Company is that the first year shall be spent in the accumulation of practical experience and the second year, in the application of that practical experience to the theoretical aspect of design, reseach and development.

Illustrations of sports activities, medical services, welfare arrangements etc., are shown on pages 20 to 21 under separate headings.

The precise syllabus of both the practical and theoretical training to be given to engineering graduates appears on pages 8 to 13.



"Planning"



Mock-up of HT-2. The First All Indian Aeroplane

CHAPTER II

THE TRADES APPRENTICE PROSPECTUS

Speaking in the wider sense, the Hindustan Aircraft scheme for the training of skilled technicians is designed to broaden the experience and the practical application of generál knowledge of young men of suitable age, taken from Government recognised Occupational or Polytechnic institutes and similar institutions whose diploma is recognised by the Government of India. (The scheme is entirely separate from, and is not to be confused with the training of University Graduates).

A famous General once made an open statement that "The Sargeant is the backbone of an army." So also is it true to state that the "backbone" of productivity in a modern factory, is the skilled technician and craftsman.

In these days of mass production of an illimitable range of commodities for public utility service, a tremendous amount of productive work can be successfully achieved by the part-time "Training within Industry" of men with only an elementary education.

Such men are trained for a specific operation in the workshops immediately upon engagement. They are trained for short periods varying between 3 and 6 months perhaps. They are then graded and set to work in a productive capacity on the job for which they have been specifically trained.

This class of worker therefore is universally employed for the execution at pre-determined rates of output of work which is known throughout the Industry as "fully productionised.'

Before "dilutee" labour can be utilised on "fully productionised" work, however, the designer will have completed many design schemes and issued many modifications, sometimes on his own initiative, more often than not, on the initiative of the production engineers, sometimes on the advice of the technician who is actually engaged in the manufacture of the prototype commodity.

This "pre-production" work, as it is called is fundamentally essestial to meet the 3 main objects of productivity :—

(a) Designing for quality,
(b) Designing for a predetermined cost value, and
(c) the Development of the article, the design and manufacture of jigs, tools and machines in order to meet given market requirements.

The vital question of "physical" development of the commodity, of the manufacture of high precision jigs, tools and equipment of all types, the manufacture of "first offs" and the true processes of "productionising" by elimination of complex operations can only be carried out by the skilled technician.

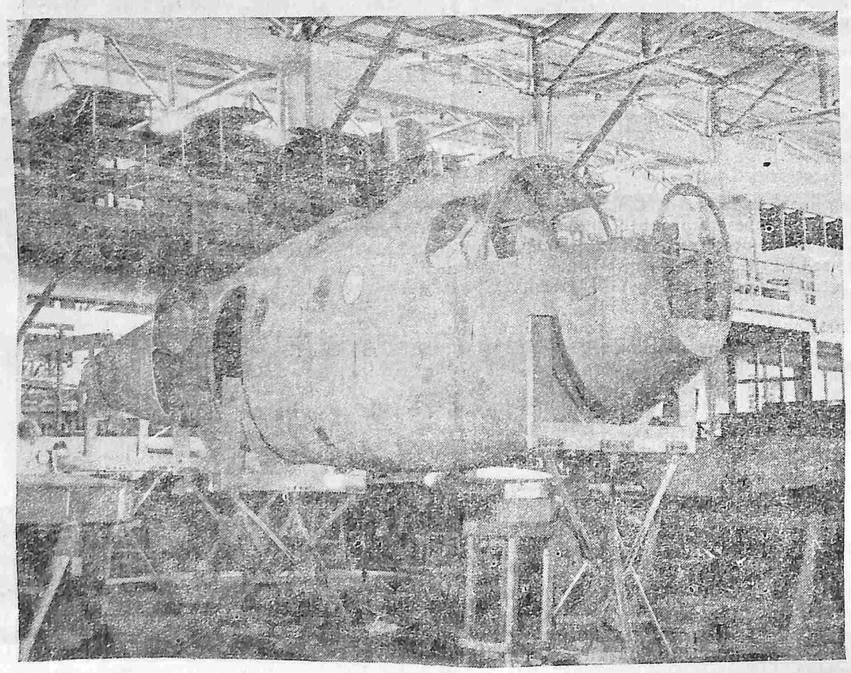
Such men, therefore, must undergo a wide range of practical training in every sphere of manufacture if they are to play their part in the cycle of events which leads finally to the mass production of the commodity by the utilisation of semi-skilled workers.

Although it is of the utmost importance that the skilled technicians should be trained in almost every sphere of hand craftsmanship, so also is it true that many phases demand that high degree of skill which can only be obtained by specialisation. For instance, the skilled sheet metal worker rarely makes a skilled tool-room mechanic. Hydraulic press and machine tool setters and operators rarely make good aero-engine assembly men and so on.

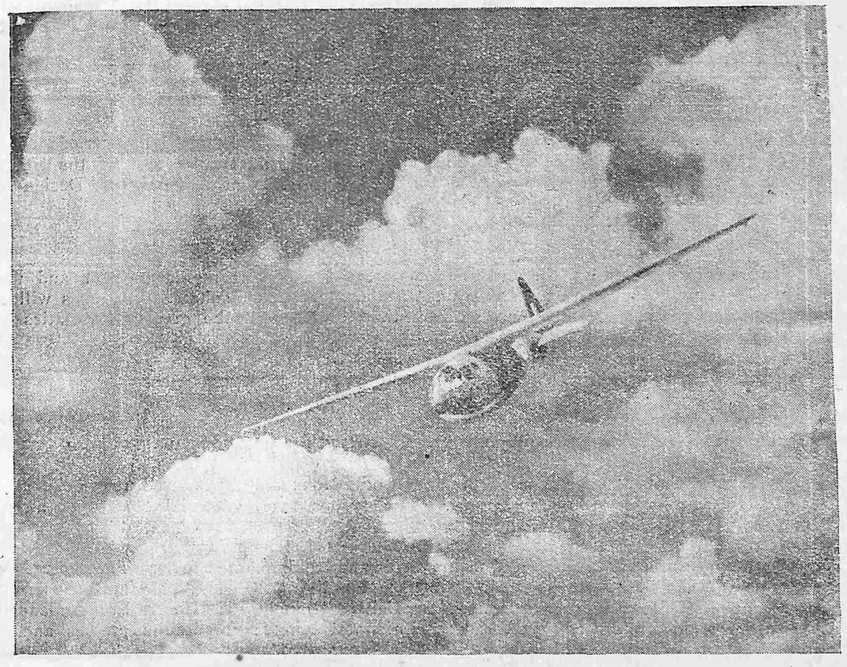
The necessity to specialise in certain highly skilled trades and the principles upon which such specialisation can be obtained, have therefore formed the basis of the initial planning by the Hindustan Aircraft Company in the composition of the training scheme for "Trade Apprentices."

The duration of training covers a total period of 3 years in the Production, Jig making; tool and maintenance shops of the factory, the period commencing on the 1st of July each year.

Successful candidates, having previously covered the general theoretical subjects and basic practical courses, in workshop training, at Occupational, Polytechnic or other institutes, will, upon acceptance, be first assigned by the APPRENTICE SELECTION BOARD to one of the 13 skilled trades outlined in the Syllabus of training given on page 7.



Fuselage of HAL 16 seat Glider



HAL Glider in Flight

In the main, there will be a general practical examination at intervals of 3 months during the course of the training, the Apprentice Selection Board compiling reports on ability, aptitude, general conduct. and application to work.

At the expiration of the first one year, all Apprentices will be required to enter a more comprehensive examination and upon which reports and recommendations will be made by the Apprentice Selection Board.

Apprentices will become fully indentured, and certified as proficient in a particular trade after the successful completion of the course.

A brief precis of the trade headings for which Aircraft Trades Apprentices may be trained under this scheme is as follows :—

(1) Comprehensive training as "General Mechanic."
(2) All types of machine tools.
(3) Specialised training for the all-important "Tool Maker."
(4) Specialised training "Pattern-maker."
(5) All aspects of "Metal Control."
(6) All types of welding techniques.
(7) Training from a "practical" view point for the "Electrician."
(8) All aspects of airframe and ancillary erection.
(9) Training in the manufacture, assembly, testing and utilisation of instuments.
(10) Airframe and engine accessories.
(11) Every aspect of power plant erection, installation, engine "running" and functioning.
(12) Training in the manufacture of parts to close tolerances, the erection and bench testing of aero-engines.
(13) Comprehensive training in methods of routing, of paper-work control labour loading and material control and the control of output to a given programme for those choosing Progress Engineering.

It will be seen by a close study of the trade headings given above that HAL Trade Apprenticeship Scheme for the training of skilled technicians is sufficiently comprehensive to produce, in the course of time grades of men proficient in their skilled capacities and upon which the development and expansion of the Aeronautical and allied Industries in India entirely depends.

A more comprehensive syllabus of the training under trade headings is given on page 14.

Pictures and illustrations of sports activities, welfare and medical services are given on pages 20 to 21 under separate headings.

CHAPTER III

SYLLABUS

Aeronautical Engineering for Graduates Training Scheme

University Graduates:

The full course of training extends over a period of 2 years divided largely into two periods of one year each, the first, as stated previously in the "Prospectus," covering the practical aspect of the training and the second year covering theoretical training in the various aspects of Aeronautical Design and Development.

Lectures:

During the entire course of 2 years, there will be a series of lectures at regular periods and these lectures will be delivered by eminent men who are specialists in their particular sphere. Lecturers will not necessarily be taken from the factory but will be recruited from time to time from the great Universities and other major Engineering Industries also.

Briefly, the course of lectures will cover the following subjects and sequences:—

(1) All aspects of aircraft materials: Processes of manufacture of raw materials including Heat Treatment · Properties of corrision: Weight/strength ratios and so on.

(2) The inspection of materials against text book specification: Methods used in stocking and controlling specialised aircraft materials: The reasons for ministerial control of aircraft material stocks.

(3) The use and operation of all types of Machine Tools and hand operated tools. The lectures on Machine Tools will include types of Machines: Speeds and Feeds: Machines special to aircraft construction: Single-operation "Specialised" machines: Centre Lathes: Capstan Lathes: Mills: Drills: Jig borers: Horizontal borers: Hydraulic presses and the techniques of "rubber"-pressing and "stretch"-pressing.

(4) The various aspects of modern techniques used by aircraft manufacturers throughout the world, methods of jigging, of quality control etc.



Radio and Radar Overhaul



Machine Shop

(5) All aspects of administration and operation of an aircraft factory.

(6) Modern methods of draughting: Reproduction of blue prints: Established methods of "Drawing Numbering": The compilation of material bills: Service Instruction Schedules: and of the compilation of Type Records, and the reason for the technical control, by published journals, special to each and every type of aeroplane.

(7) The necessity for standardisation of aircraft parts and operating units and the question of standardisation of material specification by the raw material manufacturers.

(8) Every aspect of Production Engineering or Production Control by control of labour cost: Jig and tool design: Modern methods of approach to this vital question, upon which the economy and efficiency of production depends: The reason for the introduction in modern Aeronautical Engineering of systems of "payment by result" and the control of such systems.

Lectures under the above heading will be divided into 3 parts and each delivered to Graduates at monthly intervals. The first one will commence during the first month of the two year period and the entire series will conclude in the last month. Students will be requested to write a paper subsequent to each monthly lecture. Papers will be marked by the Lecturer for future record.

Practical Training (1st year)

The first one year of the 2 years' scheme provides for broad practical training in the techniques of manufacture used by the Company.

After the expiry of the first 3 months, students will be expected to have derived sufficient experience to be able to decide whether they prefer to continue with the general training in the 13 departments or whether they prefer to specialise in any particular one of those departments, during the remaining nine months of the first year. Quite naturally, they will base their preference upon the ultimate profession which they intend to adopt.

The departments in which training is given will be largely as follows:—

1. **Foundry:** All aspects of ferrous and non-ferrous Foundry work, Moulding, Drying, Kilning, Running, Heating, Furnace Control, Fettling, Stocking, Curing and Seasoning.

2. **Machine Shop:** Students will be trained both by observation and by actual operation of the Jig borer, Horizontal borer, Centre Lathe, Milling Machines (Horizontal and vertical), Centreless Grinding, Automatic Lathes, Capstan Lathes, Heavy Drilling and hand fitting, if desired.

3. **Welding:** Students will be given the opportunity to observe the techniques of modern Are Welding, Seam Welding, Gas Welding and resistance welding of both ferrous and non-ferrous metal. They will also be given training by observation in the distortion of metals due to the localised application of heat.

4. **Heat Treatment:** Training by observation will be given in the techniques of tempering of tool steels, the Heat Treatment of high tensile steels and light alloys of all descriptions.

5. **Sheet Metal:** Practical training by hand methods will be given in the forming of Sheet Metal parts, methods of cutting, of marking, hand rolling, form rolling and pressing.

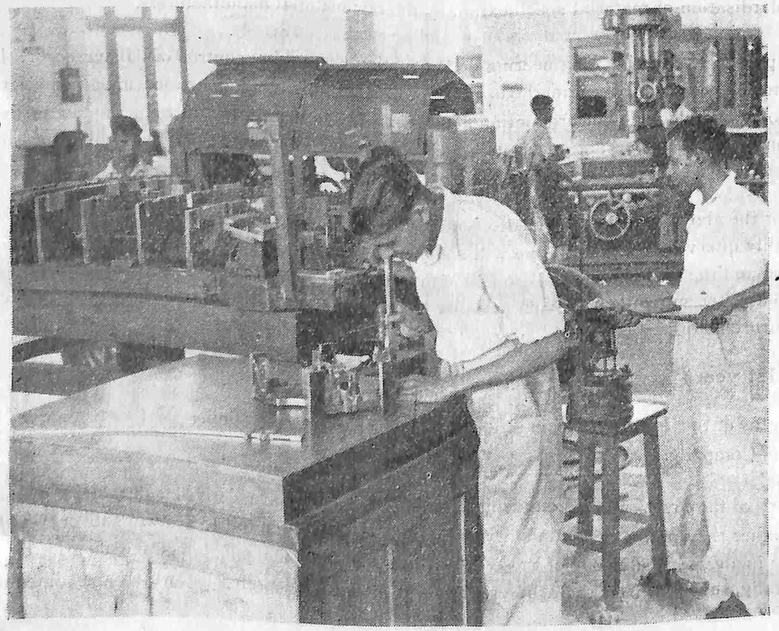
6. **Finishing and Plating Shops:** Training by observation and practical experience in the aircraft Finishing and Plating Shops; Cadmium Plating, Chromium Plating, Silver Plating will be just a few of the techniques illustrated. Buffing, Brushing, Cleaning and Sand Blasting will form a few of the techniques of the Finishing.

7. **Jig and Tool Design:** Practical training will be given to Students on Jig and Tool Design, full scale lofting, Jig and Tool manufacture and the processes and methods used.

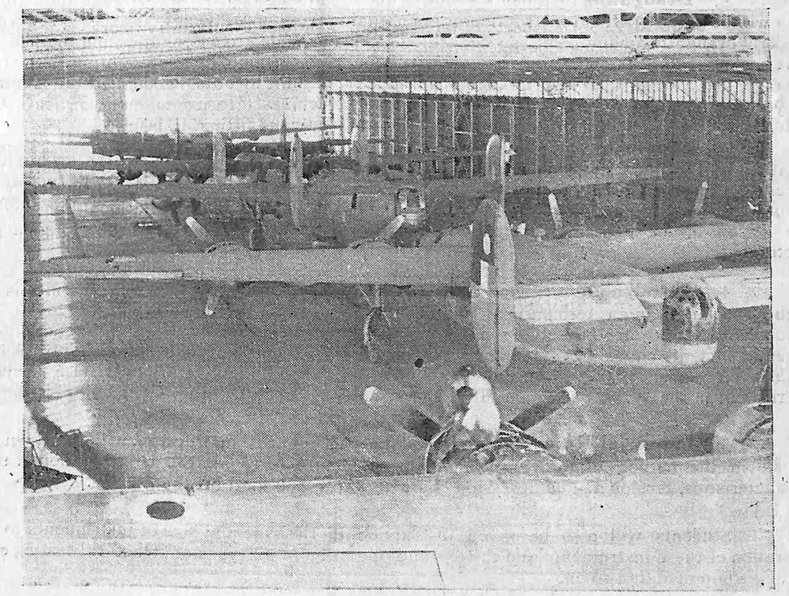
8. **Instruments:** Instruction will be given in Instruments dis-assembly and assembly, in cleaning and control of limits during overhaul and manufacture. Instruction will also be given in the testing of nstuments and the type of equipment used in the testing.

9. **Radio and Electricals:** Practical instruction will be given in the Radio and the Electrical Department which will cover the dis-assembly and re-assembly of proprietary radios of all description used in the modern aeroplane and of all items of electrical equipment.

10. **Sub Assemblies-Air Frame:** Practical instruction will be given to Students in the Airframe Sub Assembly Shop. Students will observe and will assist in the construction of major components, Fins, Rudders, Tail Planes, Elevators, Seats, Fuselage Frames, Wing Ribs and so on.



"Beginning of Production" Tool Room



"Heavy Bombers" Before Overhaul

11. **Final Assembly-Aircraft:** Practical instruction in the Final Assembly of Major Components, the Final Installation of Radio and Electrical Parts, and accessories will be given in the Final Assembly Sheds. Instruction will be given, at the same time, in the Field Service Department where students will obtain first hand knowledge of the techiques of the "First" engine runs.

12. **Engine Overhaul:** Students will observe and assist practically, in the Stripping, Re-working, manufacture of parts, Re-assembly and bench running of aero engines. They will also be given practical instruction in inspectional control for quality.

13. **Development and Experimental Department:** Practical instruction will be given in the Aeroplane Mock-up, Development and Experimental departments. In this department, almost every part will be made by hand and students will be encouraged to spend as much time as possible with the Technicians engaged upon the work. Students will also be instructed in the reason for the design and manufacture of a mock-up, and in the development, by processes of elimination of complicated structures which may incur considerable cost in the final "production version" of the aeroplane.

Final Training (2nd Year): During the second year of the student's course, he may be trained in any one of the following departments in which he may choose to specialise or alternatively he may, divide his time among 2, 4 or in fact, all departments if he so desires.

1. **Aircraft Projects:** Leaving aside the Chief Designer and the "Design Control Team" the Projects Department is really the first stage in the cycle of development of an aeroplane.

The work of the Projects Department is to take a brief specification from the Design Control Team and base upon it a "Preliminary Design Specification" giving major stressing calculations, performance specification, handling characteristics, overall dimensions, Aero-Foil Sections, Fuselage dimensions, types of engines, and so on. The Projects Department may compose a number of "Preliminary Design Specifications" before a suitable specification is agreed. This department ranks among the most interesting in an aeronautical engineering concern and students choosing this phase will be given draft specifications upon which they will be asked to design a basic project.

2. **Draughting:** Students choosing the "Drawing Office" or "Draughting" for their future profession will be given practical instruction in the actual making of Drawings, in the speedy and efficient use of modern draughting equipment, special calculators applicable to aeronautics and methods of easy reference of text books. Students will also be given instruction as to the amount of draughting that can be executed at an average, by a fully qualified Draughtsman in a given time, and also modern methods of how to reach proficiency in Drawings productivity.

3. **Stress Office:** Students choosing the Stress Office will be given instruction in the methods of location of the main stressing fields of an air frame structure. They will also be instructed in the Hindustan Aircraft Stressing techniques developed by the Chief Designer. Practical instruction will be given in the chronological and numerical compilation of the myriads of stressing calculations that have to be undertaken in the design of an airframe, and the reason for easy reference to particular stressing calculations in "Field" sections etc.

4. **Aerodynamics:** The Aerodynamics Department of the Design Office is also one of the most highly specialised in an Aeronautical Engineering Concern. Instruction will be given on every aspect of aerodynamics and in the solving of problems of control loads and ratios. Practical instruction will also be given to students chooing aerodynamics as their profession, at the Indian Institute of Science, in the Wind Tunnel on models of aeroplanes projected for design and manufacture by HAL. Experiments will also be carried out in the Wind Tunnel on Models of aircraft designed by other Companies elsewhere in Industry.

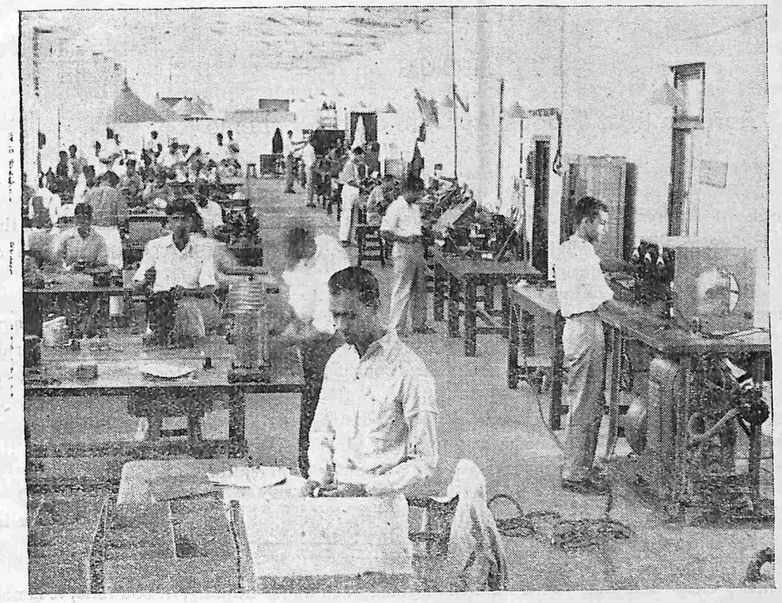
5. **Industrial Research:** Practical and academical instruction will be given to students in this sphere in the methods of applying loads to specimen structures: in the determination of torsional and bending characteristics, tension and compression characteristics, and final breaking loads.

Students will also be given instruction in the type and size of instruments to be used, the use and operation of these instruments and the use and operation of all types of structural testing equipment, electrical testing equipment and so on.

6. **Sales and Commercial:** Training in the Sales and Commercial Departments will be fully comprehensive and will cover every aspect of buying against specialist aircraft material specification: proprietary items: technical liaison between potential customers and the Company: between the operational Air Forces using the finished product and the Company, and in Sales and Publicity.



Press Shop



Accessories Branch

7. **Planning and Rate Fixing:** The Planning and Rate fixing Department is undoubtedly the department upon which the successful economy of production depends. Practical instruction in planning methods of manufacture against known factory facilities, and in planning the schematic design of Jigs and Tools and in fixing manhour rates will be given to students choosing this branch of Aeronautical Engineering.

They will, in the first place, be given draft projects to plan and in the final 6 months of the second year of the course, will be given actual planning work to execute.

8. **Production Engineering:** The Production Engineering Department is probably the most versatile of all departments in the Factory and constitutes the main link in the cycle of events which finally controls the basic design of an aeroplane to a pre-determined cost. A study of programme planning, of labour utilisation, Machine Tool utilisation, Floor space and design economics will form the main factors for training in this department.

Practical instruction will also be given in modern methods of mechanical costing, in the routing of paper work, and in the reason for institution of systems of paper control.

Finally, perhaps the most important of all, students choosing Production Engineering as their future profession will be instructed in the reason for, and the methods of, forward planning.

General Notes: If and when possible, students may be given an opportunity to take part from time to time in the test flights of Company's aeroplanes (other than initial Prototype flights). The purpose of this "flight instruction" is not to teach students to "fly" by any means, but to allow them to obtain the "Feel" of an aeroplane in flight and to observe from a purely technical aspect the characteristics of an aeroplane under differential flight conditions and loading.

This phase is purely instructional and must not generally be taken as a stage in the training of students. Special flights will not be arranged and students will take part in such flights only at their own will but with the permission and co-ordination of the Superintendent in charge and the Chief Pilot.

A complete but unserviceable aeroplane will be placed at the disposal of all students for their observation, inspection, and for the purposes of minor experiments.

CHAPTER IV

SYLLABUS

Aeronautical Trades Apprenticeship Scheme

Apprentices:

The full course of Apprenticeship training extends for a period of 3 years as illustrated in the Prospectus. The training covers the practical aspect of production and manufacturing processes, the use of machine and hand tools for specialist Engineers and Mechanics.

The object in training "Aeronautical Trade Apprentices" is to fit young men for the positions of skilled Specialists, Group Leaders, Assistant Supervisors, and finally Supervisors in the manufacturing branches both of the HAL, the Ground Maintenance Organizations of the DGCA and for other aeronautical concerns which will undoubtedly expand throughout the country.

Broadly speaking, Apprentices will be encouraged to obtain all round experience by undertaking the comprehensive training in all departments and production phases, as outlined hereafter.

In the case, however, of special suitability and personal preference, an Apprentice may spscialise in any one of the following trades after the expiry of the first year of his Apprenticehsip.

It should be made clear that due to the number of young men under training, at one time, it is not possible for all to follow the same SEQUENCE of training. For example, referring to the syllabus illustrated below, firstyear boys may be distributed by Apprenticeship Superintendent, some under the heading "General Mechanic," some in the Machine Shop, others in the Tool Room, others in the Pattern Making Shop. Each man's training history, however, will be closely followed by the Apprenticeship Superintendent and at the expiry of the three years an Apprentice (other than those specialising after the expiry of the first year) will have covered the entire Syllabus of training under the scheme.



Sectional View-Instruments Branch



Engine Overhaul

The syllabus of training embraces the following Departments and trades:

1. **General Mechanic:** Perhaps the most valuable part of a man's training is in learning the efficient use of hand tools and instruments.

Three months of the three year period will be allotted to the general Fitting Shop, where Apprentices will learn the use of the hand file, flatting, shaping, cutting and marking and also the use of the basic "Fitter's" Instruments, the rule, the Vernier, the Micrometer, Depth Gauges, Surface Gauges and so on. He will also be taught the rudiments of Drawing Office procedure to enable him to read Engineering Drawings and also the basic principles of "marking out".

This three months of general "hand" experience is one of the most vital in the entire series and regardless of specialisation, every Apprentice will be required to undergo this phase.

2. **Machine Tools:** Three months of the three year period is allotted to training by actual operation of machine tools, as follows:—

Centre Lathe
Capstan Lathe
Milling Machines (vertical and horizontal)
Grinding
Boring
Drilling
Preparation of completed work for inspection

Instruction by lectures will also be given during the three months in the Machine Shop, on the Modern methods of utilisation of varying speeds and feeds necessary for differential types of raw materials, the grinding of cutting tools and many other phases of Machine Shop auxiliary work.

Machine Shop experience is also mandatory under the Apprenticeship Rules regardless of future specialisation and self-preference.

3. **The Tool Maker:** Comprehensive training will be given in the tool and jig making shops in the methods of "setting up," "marking out," "planing," fitting to "close tolerances" and the use of all supporting instruments, the straight edge, the Protractor, the Theodolite, the Alignment Telescope.

Apprentices during this period will be given oral instruction in the necessity for accuracy in the "finish" of jigs and tools. They will also be taught the basic principles of Jig and Tool Design and further courses will be given in the reading of jig and tool drawings.

This class of training is also considered to be one of paramount importance to the Aircraft "Shop" Engineer and "Craftsman" and regardless of future specialisation, training in the Tool and Jig Shops for three months, is mandatory to all Apprentices.

4. **Pattern Maker:** Pattern making ranks among the highly skilled trades in any factory. Three months training is allotted to this phase of Apprenticeship. Practical training will be given in the choice of timbers and metals, the reason for close telerances and allowances, the reason why the Pattern makers rule is specially calibrated and how to read it.

Practical instruction will also be given in the Foundry, in order that future Pattern Makers may obtain knowledge of the best methods of moulding from patterns and dis-assembly or breakdown of the Pattern by progressive methods in order that the finished mould is not damaged.

General Carpentry work will also be taught during this period together with the utilisation of wood working machinery of all types.

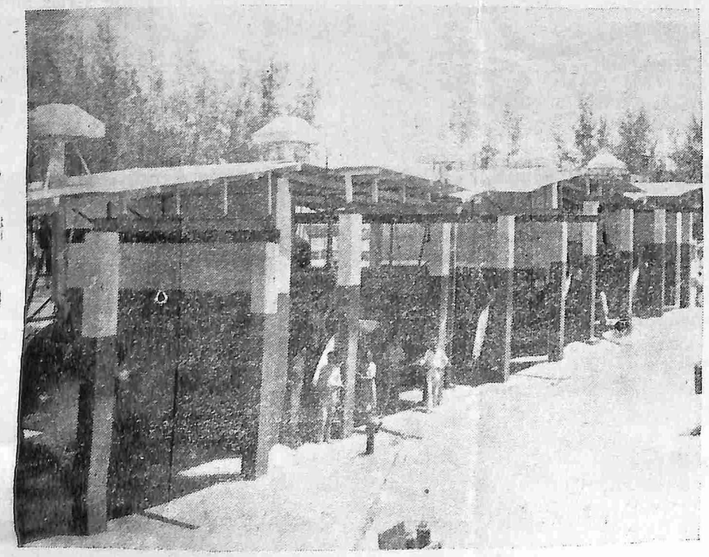
5. **Sheet Metal Worker:** Training in this sphere will be as comprehensive as possible, covering three months and regardless of specialisation and personal preference this period in the Sheet Metal Shop is mandatory under the Apprenticeship Rules. Training will be given in pre-heat treatment, working tolerances in beating of small parts, in panelling of large parts, mass production presses both brake presses and power presses, hand folders, guillotines and methods of hand forming of double curvatures etc.

Oral instruction will also be given in the basic specifications of modern light alloys and known methods of working to given tolerances including bend radii and malformation of the molecular construction of metals in un-normalised condition.

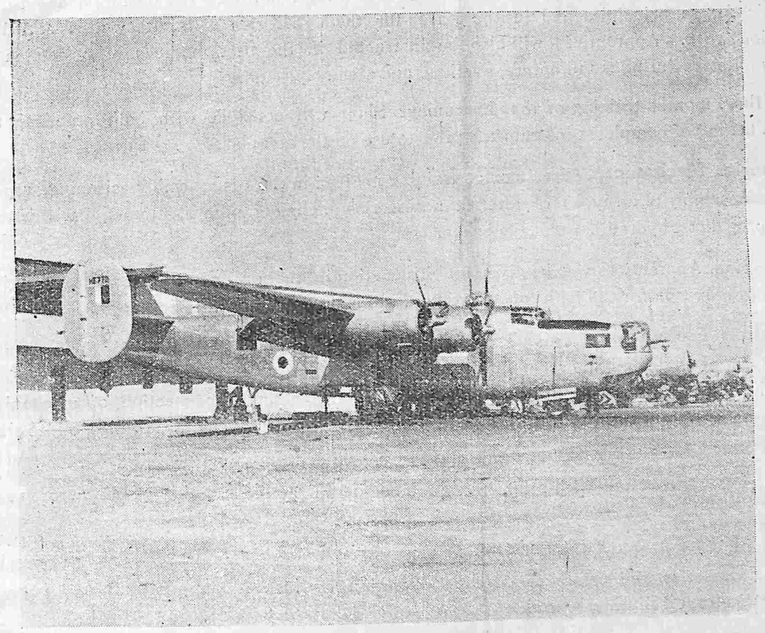
Oral instruction will also be given in the use of the "Salt Bath," working temperatures of the bath and the reason for heating metals to pre-determined temperatures prior to working and the periods during which normalised metals remain sufficiently soft for efficient "working."

6. **Welding:** Practical instruction will be given for a period of three months in all techniques of modern Arc Welding, Seam Welding, Gas Welding, Resistance Welding of both bar and sheet, ferrous and non-ferrous metals.

Oral instruction will also be given in the distortion of metals due to the localised application of heat and also in the necessity for removal of Welding flux to prevent corrosion.



Engine Running Beds



"Heavies" Ready for Service

Oral instruction will also be given on the local "crystallisation" of metals adjacent to a weld and in avoiding a resultant weakness.

7. **Electrician:** Practical experience will be given for a period of 3 months in the basic principles of Aircraft wiring systems and installations.

Practical instruction will be given also in soldering, connecting, swaging and in testing complete installations for continuity and insulation by modern methods.

Oral instruction will be given to Apprentices on the basic theory of "electrics" and the reason for the high degree of insulation and isolation in an aircraft.

Oral instruction will also be given in the reading of electrical diagrams and the various identification symbols used in aircraft wiring.

8. **Airframe Mechanic:** Practical instruction will be given in the erection of airframe fuselages, wings, major components etc. Apprentices will also be trained in methods of repair, in the fitting of large dimensional sheets, in drilling, marking, cutting, rivetting and anti-corrosive processes.

Apprentices will also be trained in methods of alignment by instrumentation and in the use of high precision jigs and tools.

Apprentices will also be instructed in the fitting, actuation and testing of all Mechanical installations including hydraulics, pneumatics and so on.

Oral instruction will be given in the reading of more complicated aircraft assembly drawings, the use and operation of the aeroplane in order to teach the Apprentices the vital necessity of working to "close" tolerances with light metals and the serious repercussions that can arise in an aeroplane from bad fitting of flight components etc.

9. **Instrument Mechanic:** Practical instruction in the dis-assembly, repair, overhaul and manufacture of parts for all types of aircraft instruments including clocks, airspeed indicators, oil pressure and temperature indicators, Gyro Pilot instruments, fuel level gauges, compasses and so on.

Oral instruction will be given to Apprentices during these three months in the operation and use of instruments, the basic design principles and in the reason for the high degree of accuracy necessitated by this very high precision work. Apprentices will also be instructed in the best methods of protection of delicate instruments and parts during manufacture, overhaul and assembly.

Finally, the three months training in the Instrument Shop will conclude with both practical and oral insrtuction in the testing of completed instruments prior to use on the aeroplane.

10. **Accessories Mechanic:** Three months training is given in the dis-assembly, cleaning, repair, renewal of parts and re-assembly of all types of aircraft accessories including pumps, motors, carburettors, constant speed units, propellers, hydraulic parts, jacks etc.

During this period, Apprentices will be given oral instruction in the operational use of accessories, the reason for them and the reason for the high tolerances used in manufacturing these vital parts.

11. **Installation Technician:** This phase of the Apprentices training will extend for three months and will cover every aspect of engine and power plant erection and installation in the airframe. Apprentices will be instructed in efficient methods of pipe fitting and the sealing of joints, the connection of mechanical controls, the final fitting of the propeller and constant speed units. the assembiy of engine cowlings, oil coolers, oil systems and so on.

Finally this period will conclude with practical experience in the actual running of an aero engine under test.

Oral instruction will be given in imparting a knowledge of the necessity for accurate, progressive installation of engine accessories, the clearance of each operation by inspectional procedure and possible ramifications that can arise from "slipshod" work.

12. **Aero Engine Mechanic:** Comprehensive training in the dis-assembly, cleaning, inspection, rework and re-assembly of all types of aero engines will be given to the Apprentices for a period of three months.

Manufacturers' tolerances and methods of utilisation of special extraction and dis-assembly and assembly tools will be explained.

Methods of obtaining close tolerances during manufacture and assembly will be given in close details.

Further oral instruction will be given to Apprentices during this period in the reason for humidity and temperature control in an engine manufacturing and overhaul shop and in the reason for dust extraction and the necessity to keep parts perfectly clean and free from foreign matter at all times during the entire series of operations.

Finally this period of training in the Aero Engine Shops concludes with practical experience in the "ground running" of all types of aero engines in the Hindustan Aircraft Engine Test House.

13. **Progress Engineers:** Training for the position of Progress Engineer will not normally be a recognised phase of the Apprenticeship Training and will be given only to those Apprentices wishing to specialise in this particular sphere. In such cases, comprehensive training for a suitable period will be given in the methods of routing of paper work, in the issue of work programmes and in the necessity for the factory to observe a pre-determined programme of work.

Training will also be given in shop labour loading, material control, and the application of Drawing Office modification procedures and material alternatives.

Oral training will also be given in the methods of raising progress charts and statistical information and in the general principles of production control from many other aspects.

General: During the entire period of training, all Apprentices will be required to enter a simple examination at three monthly periods, in addition to which the Supervisors will be asked to give a brief report on the Apprentice's adaptabilities, capabilities and general conduct together with any recommendation considered suitable.

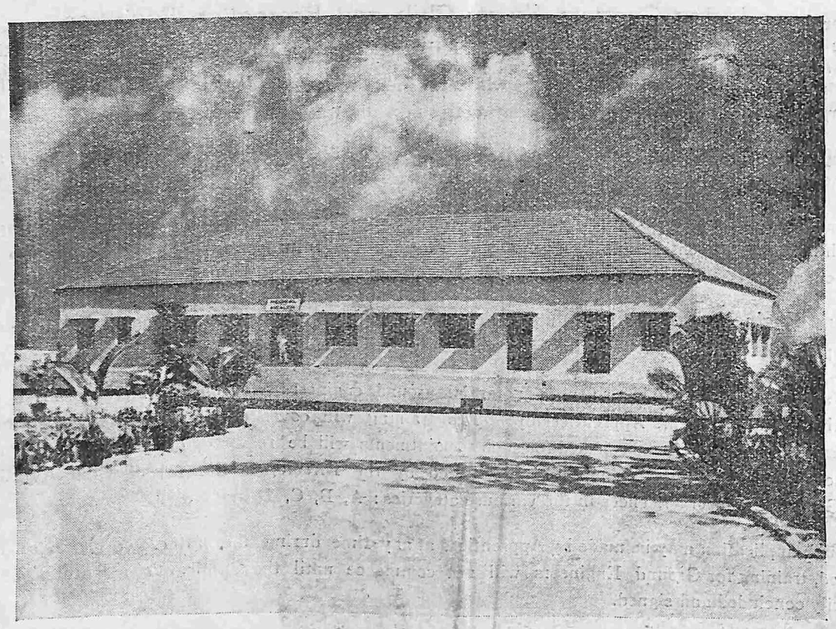
Normally, the three monthly examination is merely a progressive check on the suitability and capability of each Apprentice.

At the expiry of the first one year, however, a more comprehensive examination will be arranged and upon which both the Apprentice and the Company will decide the future training for specialisation or otherwise of each man.

Ground Engineers: Based purely upon selectivity, examination, supervisory reports and personal preference, Apprentices may apply for later specialisation as future Ground Engineers.

This special training to be given to potential ground engineers will only commence after the completion of the entire three years Apprenticeship The training will cover every aspect of inspectional control and young men preferring and selected for such appointments will be required, on completion of the Ground Engineer's training to enter examinations instituted by the Directorate General of Civil Aviation and to obtain Ground Engineer's licences in the various categories: A, B, C, D and X.

Although application may be made by Apprentices at any time during the latter two years of the three year period, training for Ground Engineers will not commence until the applicant's indentures have been satisfactorily concluded and signed.



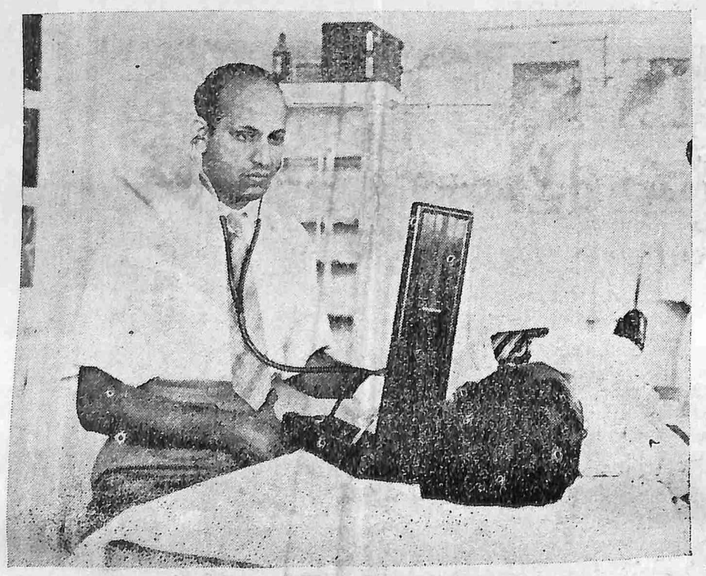
Dispensary

CHAPTER V—GENERAL

Hindustan Aircraft Limited Medical Services

A qualified M D is employed by the Company and is resident within the precincts of the Factory. A modern uptodate surgery and dispensary is available to him and all day to day medical services are given free. All employees of the HAL Organisation enjoy the privileges of our medical service.

A picture of the exterior of the Dispensary is shown above and a picture of the interior of Main Surgery is shown below.

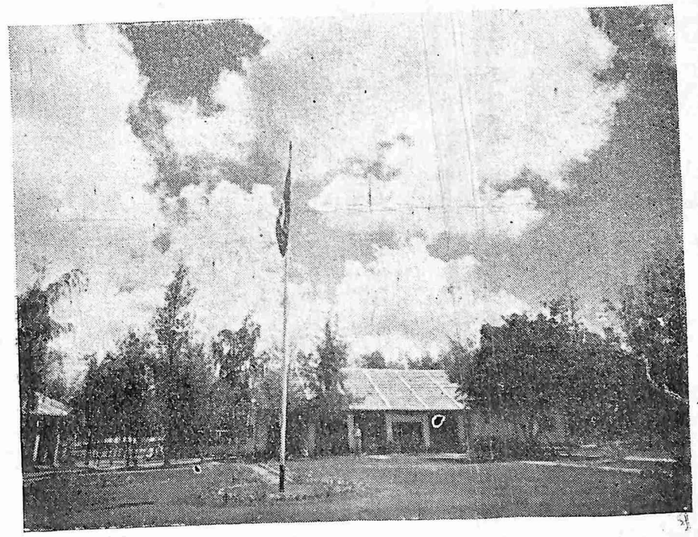


Surgery

Apprentices Living Quarters, Sports Club and Recreation Facilities

Attractive Bachelor Quarters for young men undergoing training by both schemes, the University Graduate and the Trade Apprentice alike, are being arranged adjacent to the Factory. All young men accepted for training under either of the two schemes will enjoy their own mess room and recreation rooms.

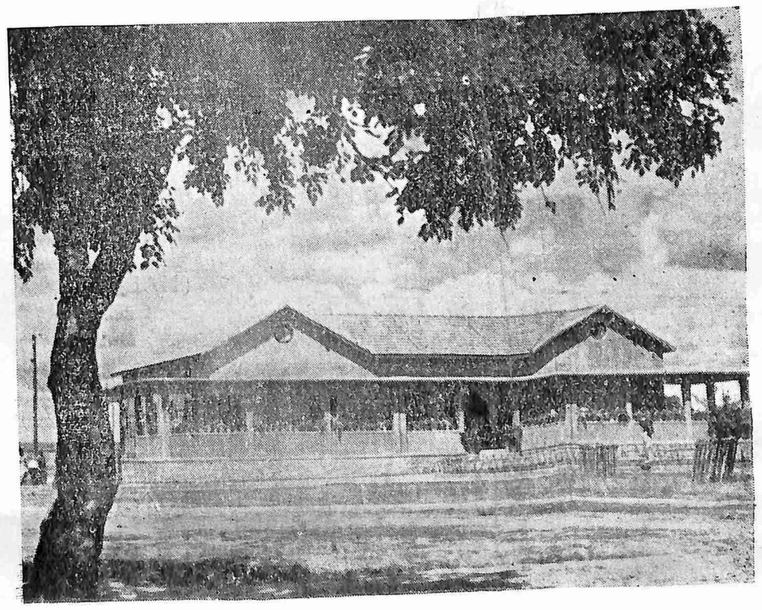
The setting of the Bachelor Colony is most attractive as is illustrated in the picture below.



Students Mess Hall

The HAL Sports Club is perhaps one of the finest Sports Organizations in South India. There are ample facilities for Hockey, Football, Cricket, Tennis and all general athletics. An annual athletics meeting is held with both open and closed events and handsome rolling trophies are presented to the departmental teams scoring the highest points.

Sports Club fees are so low as to be almost negligible and all members have the free use of the Club House and Sports Ground. A picture of the main Sports Club House which, incidentally, is adjacent to the Apprentices' living quarters is shown below.



Sports Pavilion

For further information in connection with conditions of contract and stipends, Inter Alia,

Please apply to :—

The Personnel Manager,

Hindustan Aircraft Limited,

Bangalore, South India.

IN REQUESTING FURTHER PARTICULARS,

WHICH MUST IN EVERY CASE BE MADE IN WRITING,

PLEASE REFER AS APPROPRIATE TO :—

(*a*) CONDITIONS OF CONTRACT (GRADUATES)
—Form No. HAL/ATO/1

(*b*) CONDITIONS OF CONTRACT (TRADE APPRENTICES)
—Form No. HAL/ATO/2

(*c*) APPLICATION FORM FOR GRADUATES —(HAL/ATO/3)

(*d*) APPLICATION FORM FOR TRADE APPRENTICES :
(HAL/ATO/4)

(*e*) PROSPECTUS/SYLLABUS—(HAL/ATO/5)

(*f*) FORM OF INDENTURE (TRADE APPRENTICES)—(HAL/ATO/6)

(*g*) CONTRACT AGREEMENT (GRADUATES)—(HAL/ATO/7.)

PRINTED AT ASSOCIATED PRINTERS—BY K. V. VAIDYANATHAN

22