

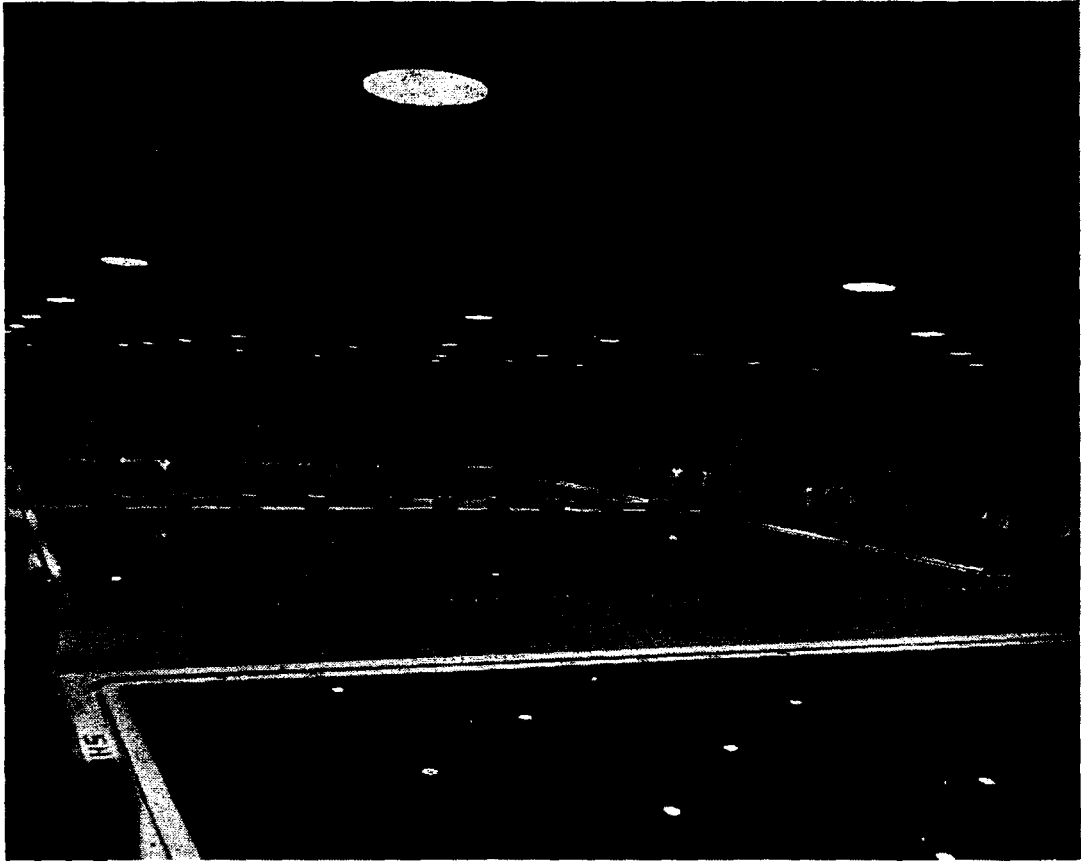
R.C.N. ENGINEERING BRANCH TRAINING

BY

LIEUTENANT-COMMANDER J. P. EDWARDS, R.N.

INTRODUCTION

In the January, 1957, edition of the *Journal* (Vol. 10, No. 1), the reorganized trade structure of the Engineering Branch of the Royal Canadian Navy was explained in an excellent article by an R.C.N. officer. As it is the Author's privilege to be currently associated with the training of engineering branch personnel in Canada, and as Lieutenant Moore's article conveniently provided the background, it is considered opportune to submit an account of the training given in the various ships and establishments to satisfy the requirements of this trade structure.



THE SWIMMING POOLS—H.M.C.S. ' CORNWALLIS '

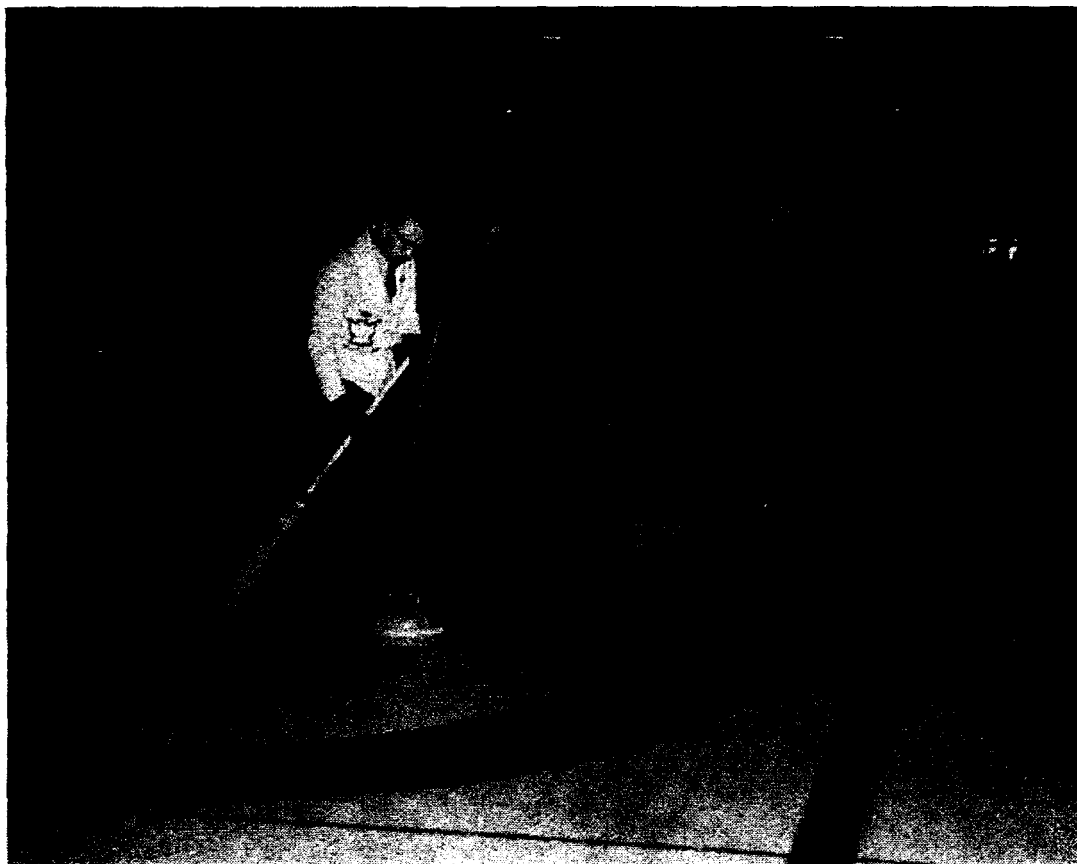
The changes in size and stature of the R.C.N. since pre-war days have been somewhat phenomenal. In 1939, the total number of officers and men serving in the R.C.N. was a mere 1,500 ; in less than six years this number had grown to nearly 100,000. After the war, demobilization quickly reduced the complement to 7,500, but since then the R.C.N. has steadily grown so that now there are 20,000 highly trained men serving in it, and the ships in which they serve are second to none.

Canadians frankly admit they are in the fortunate position of being able to profit from the proved innovations of the R.N. and the U.S.N., but it is becoming increasingly evident that they are producing their own equipment, and training their officers and men, to meet the particular requirements of their own Navy.

Training Establishments

Those establishments with which the ' E ' and ' A/E ' branches are particularly concerned are as follows :—

- (1) H.M.C.S. *D'Iberville*—English language training
- (2) H.M.C.S. *Cornwallis*—New-entry training and leadership school
- (3) M.T.E., Halifax
- (4) M.T.E., Esquimalt
- (5) H.M.C.S. *Cape Breton*—Artificer apprentice training
- (6) Naval Air Maintenance School
- (7) The Canadian Services Colleges



CURLING ON THE ICE RINK—H.M.C.S. 'CORNWALLIS'

- (8) H.M.C.S. *Ontario*—Cadet training cruiser
- (9) H.M.S. *Thunderer*—For both General and Branch List officers.

As the Author's appointment in Canada is more directly concerned with the training of the E.M. and E.R. branches, this article is mainly devoted to an explanation of the function and methods of training at the M.T.E.s. However, a brief account is included of the work carried out in some of the other establishments.

H.M.C.S. 'CORNWALLIS'

Situated on the west coast of Nova Scotia this huge establishment (said to be the largest naval training establishment in the Commonwealth) is ideally suited for new-entry training. Being remote from any large towns it is, of necessity, self supporting in every way. The recreational facilities for the 900 or more new entries, the staff and their families, are almost unique. The big recreational centre (which is run by a talented civilian manager) has a cinema, bowling alleys, canteens, library, etc. In addition, there are three swimming pools, a massive gymnasium and, as one might expect in Canada, an ice rink.

The new-entry course is of twenty weeks' duration, and a new batch of recruits arrives about once a fortnight. Each batch forms a division and they remain as a division for the whole course. The divisional system is very similar to that in R.N. training establishments.

Recruits are signed according to the vacancies existing at the time in the various branches. (There is no National Service in Canada). Personnel

Selection Officers at the various recruiting centres across Canada select the man for the job. Each branch has its own minimum 'G' Score (aptitude factor) for entry—that for the Electrical Branch is by far the highest.

Although this is not a common entry, the new entry training is common for all branches, and there is limited opportunity for branch transfer towards the end of the course. Every man joining or re-entering the R.C.N. must pass through *Cornwallis*. Petty officers, second class, and below do the new entry course as ordinary seamen, and it is only when they have completed the course that they assume their proper rank. Re-entries and ex-R.N. personnel (of which there is a substantial number) who join as petty officers, first class, or above take the leadership course. Direct entry artificers take the leadership course after new entry training.

The course is designed to introduce men to the way of life in the Navy. The emphasis is on seamanship, parade training, discipline and morale building. The working day commences with divisions at 0830, and throughout the 5½-day week instruction and recreational activity keep the men occupied until the late evening.

During the 6th and 12th weeks the division is employed on part of ship duties and carry out such duties as messengers, guard sentries, cleaners, etc. Specialist officers and chief petty officers conduct branch introductory lectures during the 14th week, and the 15th week is spent at sea on board the frigate attached to *Cornwallis* for this purpose.

At the end of the course there is a 14-day leave period, after which the men proceed either to sea or to their branch training establishment for specialized training. As there are only two depots in Canada, Halifax and Esquimalt, 3,000 miles apart, it is likely that many of them will never meet again during their naval careers.

THE MECHANICAL TRAINING ESTABLISHMENTS

The M.T.E. at Halifax is located in H.M.C.S. *Stadacona*, as are the majority of the east coast 'schools'. The west coast M.T.E. is similarly located in H.M.C.S. *Naden*. A new combined technical training establishment is nearing completion on the west coast, where all the technical branches will train together under the overall direction of a senior technical officer. It is envisaged that the apprentices now being trained in H.M.C.S. *Cape Breton* will also move to this establishment.

The M.T.E. at H.M.C.S. 'Stadacona'

This establishment has recently been enlarged and modernized to meet the increased commitments of a growing Navy. The numbers under training vary considerably during the year owing to a large influx from the Reserve during the summer months. An average figure for the number of regular personnel under training is about 160.

The permanent staff consists of :—

- 1 Commander (E) in charge
- 2 Lieutenant-Commanders (E)
- 1 Shipwright or Constructor Lieutenant-Commander
- 1 Instructor Lieutenant-Commander
- 6 Lieutenants (E)
- 2 Commissioned Engineers
- 1 Commissioned Officer (S.B.) i/c painter training courses ;

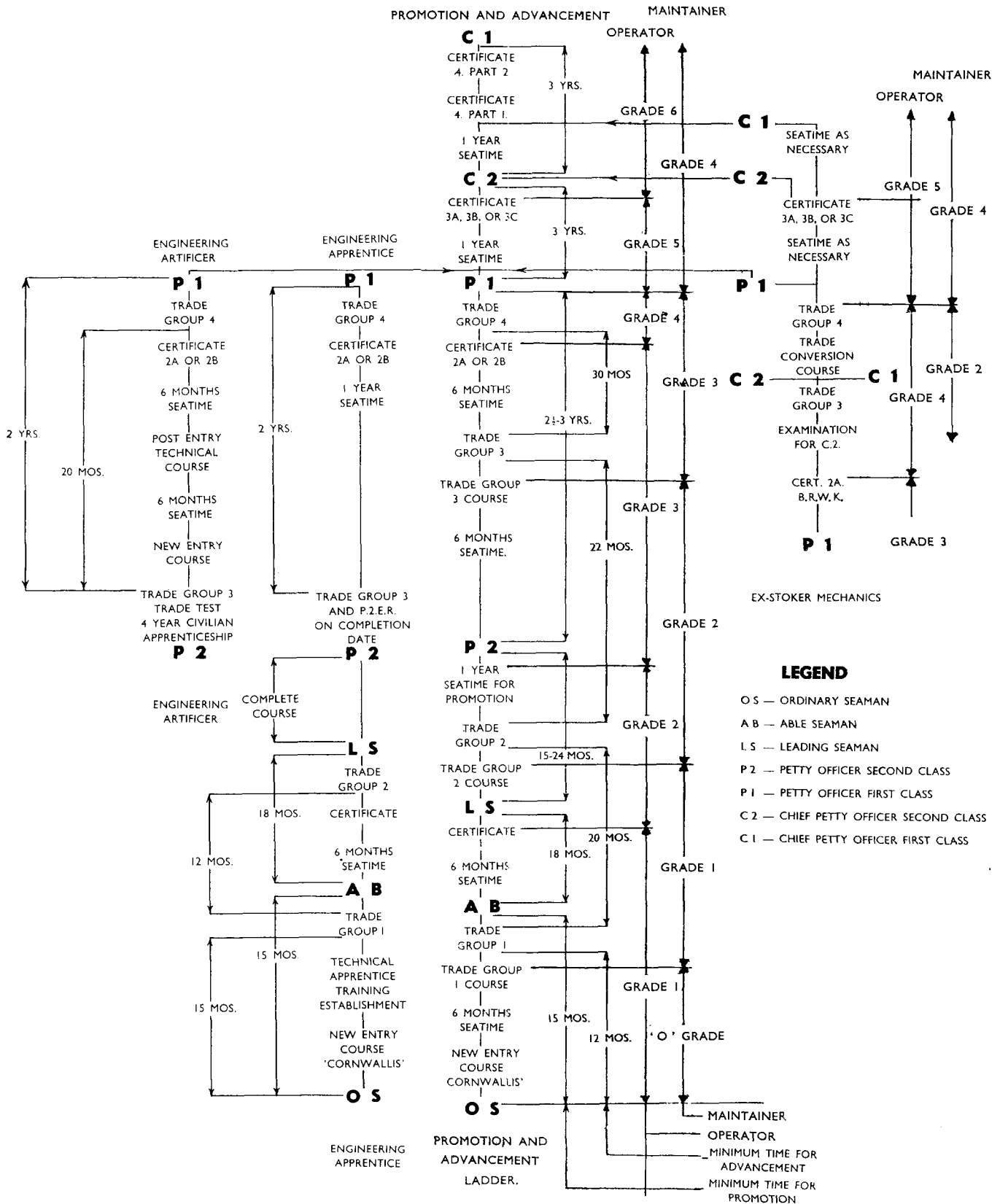


FIG. 1—PROMOTION, ADVANCEMENT AND OPERATOR MAINTAINER RELATIONSHIP CHART

TABLE

| Trade Group I | | Trade Group II | | Trade Group III | | Post Entry Technical Course (for Direct Entry E.R.s) | |
|--------------------|------------------|--------------------|------------------|---|------------------|--|------------------|
| Subject | Duration (weeks) | Subject | Duration (weeks) | Subject | Duration (weeks) | Subject | Duration (weeks) |
| Diesel Engineering | 1 | Maths. and Physics | 5 | Engineering Physics | 2 | Marine Engineering | 9 |
| Marine Engineering | 2½ | Mechanical Drawing | 1 | Ship Refit | 9 | Diesel Engineering | 4 |
| Fitting Shop | 2½ | A.B.C.D. | 2 | Fitting Shop | 9 | Refrigeration | 2 |
| | | Marine Engineering | 5 | Machine Shop | 3 | A.B.C.D. | 2 |
| | | Diesel Engineering | 3 | Mechanical Drawing | 2 | Mechanical Drawing | 1 |
| | | Fitting Shop | 2 | Welding/Blacksmithing Diesel Engineering | 4½ | | |
| | | | | Brickwork, Boiler Preservation and Insulation | 1 | | |
| | | | | Bailey Meters | 1 | | |
| | | | | Refrigeration | 2 | | |
| | | | | Coppersmithing | 1 | | |
| | | | | Foundry | ½ | | |
| | | | | Marine Engineering | 7 | | |
| Total | 6 | Total | 18 | Total | 43 | Total | 18 |

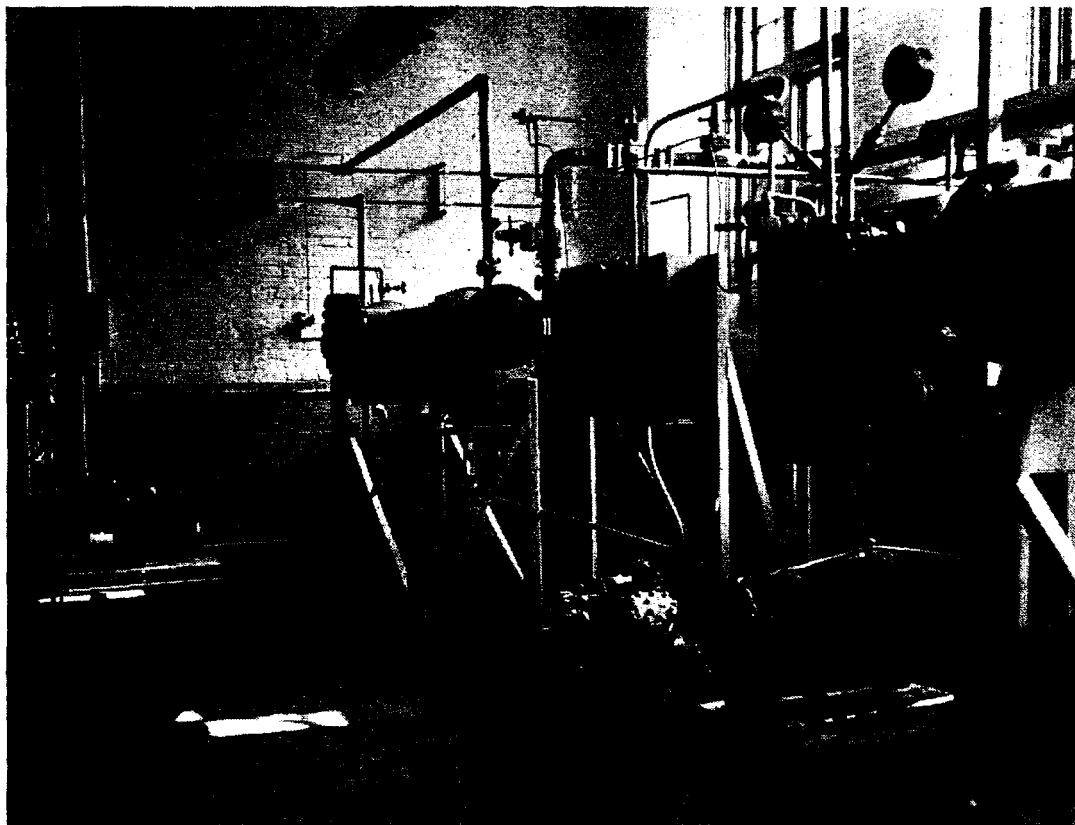
and about thirty chief petty officers, first and second class. This number is augmented to a certain extent by personnel who are in depot awaiting draft, etc.

Virtually all instruction is carried out by the chief petty officers, and with one or two exceptions (e.g. fitting and machine shops, where, because of their background, E.R.s are more suitable), E.M.s and E.R.s are completely interchangeable.

The type, variety and length of courses held at the M.T.E.s are shown in the TABLE. Courses are arranged by the drafting authorities so that average number per class is about fourteen. By far the largest group under instruction is the E.M.s taking either trade group 1, 2 or 3 courses (see FIG. 1 for rank and trade structure). The training of the E.M.s is carefully arranged so that the three trade group courses are 'dovetailed' to give progressive instruction even though there may be a considerable time interval between them.

In addition to those shown in the TABLE the following miscellaneous courses are held at the M.T.E.s :—

1. *Courses for Reserve Personnel*—Continuous during summer months.
2. *Junior Officers' Technical and Leadership Course*—Marine engineering and ship construction course for executive officers (2 weeks).
3. *Makers Course*—For chief petty officers and petty officers (E.M. and E.R.) standing by new construction ships. Consists of eight weeks visiting firms, six weeks at the M.T.E. and A.B.C.D. school.
4. *Refrigeration and Air Conditioning Maintenance Course*—3 months.
5. *Maxim Evaporators Course*—2 weeks.
6. *Bailey Meter Maintenance Course*—2 weeks.



THE REFRIGERATION AND AIR CONDITIONING DEMONSTRATION INSTALLATION—M.T.E.,
HALIFAX

7. *Skill of Hand Trade Tests*—For dockyard apprentices and ordnance mates
8. *Welding Course*—4 weeks.
9. *Certificate 4 Course*—For C2E.M.s and C2E.R.s. This course is scheduled to become operative in 1958. Probable duration 10 weeks.
10. *Painter Training Course*—For officers and men (2 weeks).
11. *Shipwright Training Courses*—At various trade group levels.

Marine Engineering

The trade group I instruction in this subject is designed to provide elementary knowledge of the function and basic construction of machinery and systems. At the trade group II level they learn how the construction and operation of machinery links up with the operation of the various systems. Detailed instructions on operation, construction and maintenance is given to the P2.s in the trade group III courses.

Diesel Engineering

Basic construction and motor boat operation are taught for trade group I. The trade group II Diesel course is partly practical and the L.S.E.M.s are taught to carry out routine maintenance up to 1,000-hour routines. At trade group III level the 5-week course is designed to provide P2.s with detailed knowledge of construction, operation and maintenance, with the skill of hand of a fitter, on Diesel engines.



ONE OF THE FITTING SHOPS—M.T.E., HALIFAX

Skill of hand

Practical training in the trade group I course provides familiarization with the use of common tools which will enable an able seaman to carry out such maintenance work as cleaning joint faces, cutting joints, using taps and dies, etc. The trade group II course raises their skill to the extent where they should be able to perform minor maintenance on their own (refitting valves, drilling holes, etc.) and where they can usefully assist the more qualified tradesmen in carrying out more complex maintenance tasks.

Practical training forms the most important part of the trade group III course. Here they are taught and exercised in the finer points of fitting, and receive instruction in the use of machine tools to the extent of providing them with an acquaintance of the possibilities of these machines. The contribution made by P2.E.M.s of this course towards Fleet maintenance during their 7-week ship refit training is recognized by the frequent complimentary letters received at the M.T.E.

The projects are designed to meet the requirements of each phase of practical instruction, and there is a final trade test at the end of the trade group III course.

Mathematics and Physics

The courses at trade group II and III levels have recently been lengthened to provide a better background for the E.M.s in the fundamentals of engineering science. The Basic Educational Test (which is of a slightly higher standard than E.T.1) must be acquired before P2.E.M.2s are eligible to take the trade group III course.



THE DRAWING CLASSROOM—M.T.E., HALIFAX

The R.C.N. have recently commissioned a technical book writing firm to produce a book on marine engineering fundamentals which is intended to replace B.R.2007 and the other course notes which are at present used at the various trade group levels.

Examinations

All examinations, projects and trade tests are set and marked by the Examination Officer. (The examination office staff consists of 1 Lieutenant-Commander (E), 1 C1.E.R.4, 1 C2.E.M.4 and a writer). The M.T.E.s also set and conduct examinations for Certificate 2, Part II and Certificate 4, Parts I and II. (Explanation of these certificates is given later in the article).

Consistent with current R.C.N. policy, objective type, multiple choice questions are used for all examinations up to, and including, those at trade group III level. However, trade group III level examinations also consist of one or two essay type questions in addition to the multiple choice questions. The examinations above this level are designed to test a man's ability to express himself as well as to test his knowledge and are, therefore, almost entirely of the essay type. This system of examination was originally based on the U.S.N. publication Nav. Pers. 16808-A, *Constructing and Using Achievement Tests*, but has since been modified and expanded to suit R.C.N. training methods.

Depending on the length of the course, between 80 and 150 multiple choice questions are included in an examination. A 'pool' of questions, each one recorded on a separate record card, has been compiled for each examination. Each worked paper is analysed and a record of the answers kept on the record card. In this way the effectiveness of the question and the instruction given can be checked. The examination officer maintains a close liaison with course

| <i>MECHANICAL TRAINING ESTABLISHMENT</i> | | | |
|---|---------------|-------------------|---------------|
| <i>COURSE</i> | | <i>DATE</i> | |
| <i>NAME</i> | | <i>RANK</i> | |
| | | <i>O.N.</i> | |
| <i>CLASS NO.</i> | | | |
| Read each question and each choice carefully. Indicate the answer of your choice by crossing the corresponding letter in the appropriate block. If you wish to change an answer, block out the original letter and cross a new one. <i>IF YOU DO NOT KNOW THE ANSWER</i> , omit rather than guess—each wrong answer will affect the deduction made for guessing. | | | |
| 1. A B C D E | 31. A B C D E | 61. A B C D E | 91. A B C D E |
| 2. A B C D E | 32. A B C D E | 62. A B C D E | 92. A B C D E |
| 3. A B C D E | 33. A B C D E | 63. A B C D E | 93. A B C D E |
| | | | |

FIG. 2—SPECIMEN OF MULTIPLE CHOICE EXAMINATION SHEET

officers and instructors and advises them on methods of training and the material to be taught. The results of every examination are reviewed in detail by the examination officer and the instructor concerned, and post mortems are conducted with the classes in the light of the analysis of the results.

An objective type, multiple choice question may be something like this :—
Economisers are fitted to :—

- (a) Pre-heat the air before it passes into the furnace
- (b) Use furnace gases to heat feed water
- (c) Use exhaust steam to heat feed water
- (d) Heat oil fuel with exhaust steam
- (e) Condense exhaust steam in harbour.

Part of a specimen answer sheet is shown in FIG. 2.

The completed answer sheets are marked quickly and easily by means of a master stencil. The final percentage is calculated after a deduction has been made for guessing. The 'guessing factor' is governed by the number of choices per question and the number of incorrect answers.

The setting up of this type of examination system has already proved invaluable. It has the following advantages :—

- (a) It ensures that a more complete examination coverage of the syllabus is being achieved by the use of multiple choice questions
- (b) This in turn leads to improved coverage of the syllabus by the instructors
- (c) Inadequacies in instruction are pin pointed
- (d) By having the examination and projects marked by a separate examination section, complete impartiality is obtained
- (e) The standard of the examinations is equal for all classes, and the marking system is watertight
- (f) Methods have been devised so that marking can be done quickly and easily, thus enabling a post-mortem to be held almost immediately. The number of men sitting an examination poses no marking problem, which might be a very important factor in time of war.

Instruction

Lieutenant Moore, in his article, quoted examples of various training aids that are now being extensively used. The transparencies are of exceptional value, and there is a very good range of films available.

All instructors and course officers are required to successfully complete the Instructional Technique Course. Detailed lesson outlines are prepared jointly by the course officer and instructors and progressive tests are held at regular intervals so that instructors can ascertain the individual progress of the men they teach.

THE CERTIFICATES (FOR E.M.s AND E.R.s)**Certificate 1**

This is the Auxiliary Machinery Operator's Certificate and is the equivalent to the old A.W.K. Certificate.

Certificate 2

This is divided into two parts :—

Part I—Boiler Room Watchkeeping Certificate or I.C.E. Engine Room Watchkeeping Certificate.

Part II—Marine Engineering Knowledge and Administration.

The examinations for this certificate are considered to be the turning point in a man's career and consequently the standard set is of a high order. Part I may be obtained by a P2 after six months sea-time. Part II can only be taken after the trade group III or P.E.T.C. courses have been successfully completed. Except in ships where a commander(E) is borne, the examination and board are conducted by the M.T.E.s.

This certificate is a requirement for trade group 4.

Certificate 3

This is the Engine Room Watchkeeping Certificate (steam) or I.C.E. Maintenance Certificate, and is a requirement for promotion to C2.

Certificate 4

Part I of this certificate, Marine Engineering Theory, consists of two written papers and must be passed before a candidate is eligible to sit Part II, the Charge Certificate.

This certificate is the qualification necessary for promotion to C1.

H.M.C.S. 'CAPE BRETON'

(Technical Apprentice Training Establishment)

As an interim measure, an escort maintenance ship was adapted for the purpose of training artificer apprentices, and the first class joined the ship in January, 1953. A new class of 25 joins every six months.

The number per class allocated to the various technical Branches varies, but the annual distribution is approximately :—

- 50 per cent Engineering
- 20 per cent Electrical
- 10 per cent Air
- 10 per cent Shipwright
- 10 per cent Ordnance.

LEGEND

NAVAL AIR BRANCH

- AR—AIR RIGGER
- AF—AIR FITTER
- AO—AIR ORDNANCEMEN
- AC—AIR CONTROLMEN
- SE—SAFETY EQUIPMENT TECHNICIAN
- PC—PLANE TECHNICIAN
- AT—AIR ARTIFICER
- TG—TRADE GROUP
- C1—CHIEF PETTY OFFICER FIRST CLASS
- C2—CHIEF PETTY OFFICER SECOND CLASS
- P1—PETTY OFFICER FIRST CLASS
- P2—PETTY OFFICER SECOND CLASS
- NAMS—NAVAL AIR MAINTENANCE SCHOOL

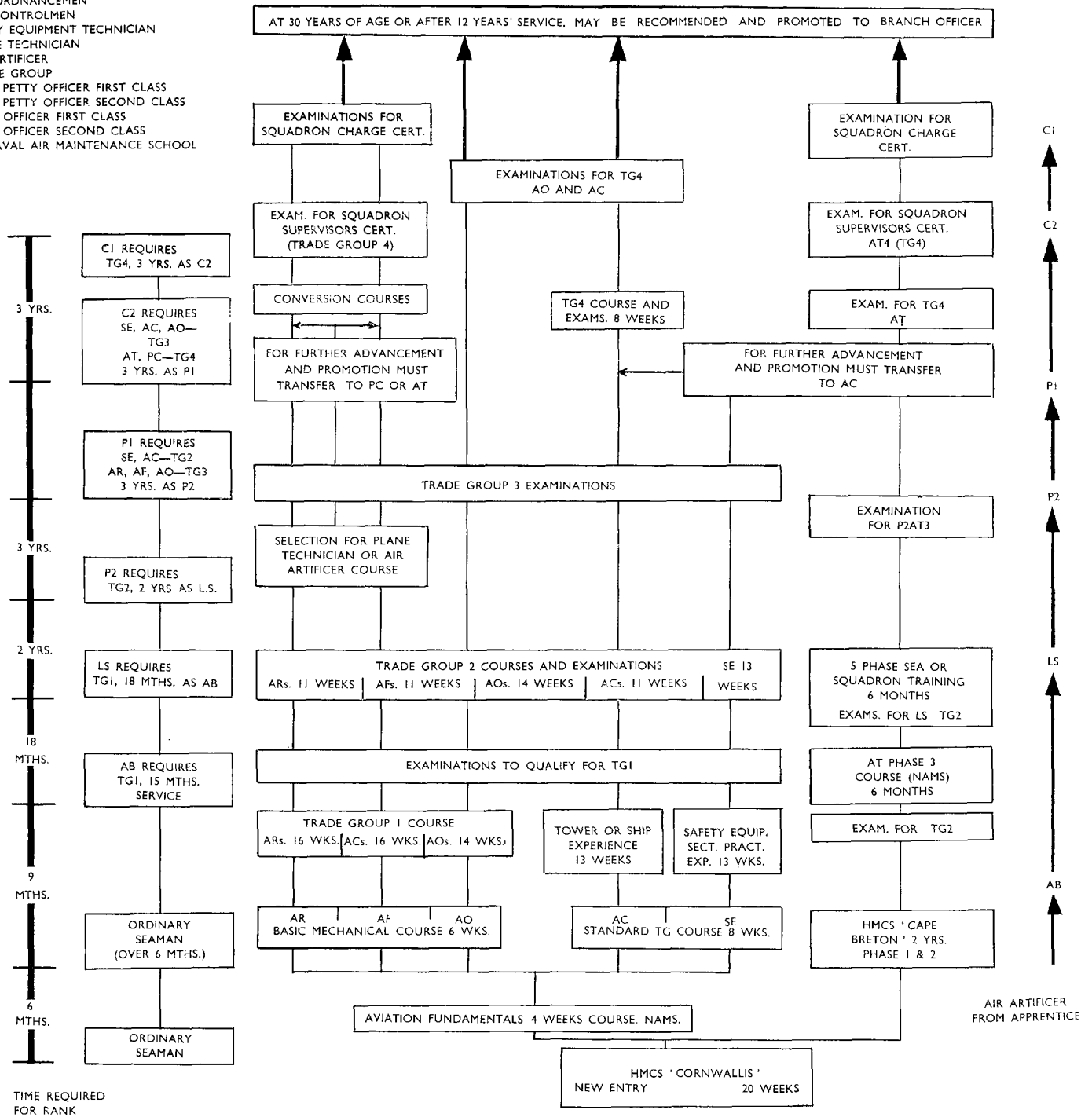


FIG. 3—PROMOTION AND ADVANCEMENT CHART—NAVAL AIR BRANCH

Entering the Navy at 16 to 17 years of age, they complete the 20 weeks new-entry training before joining *Cape Breton* as ordinary seamen artificer apprentices (O.S.A.P.). Their apprenticeship training lasts for 39 months and only the first year is common for all branches. The shipwrights start specializing at the end of the first year, and the remaining Branches at the end of the second year. All apprentices have six months' sea time during the 39 months, but at varying stages. The engineering apprentices proceed to sea after the second year and are promoted leading seamen at the end of their sea time. While at sea they are required to obtain Certificate 1.

On graduating, all apprentices are promoted to petty officers, second class, trade group 3, and before proceeding to sea, do the leadership course at H.M.C.S. *Cornwallis*.

Whereas some Branches were originally sceptical of the apprentice scheme, the standard of the first graduates since they joined the Fleet has proved that it is well worth while. The scheme is still relatively in its infancy and frequent changes are being made in the light of experience.

THE NAVAL AIR MAINTENANCE SCHOOL

The R.C.N.'s Naval Air Arm is a relatively new innovation. N.A.M.S. was only opened in 1945 but it is now one of the most impressive of the R.C.N.'s schools. In size, complement, and method of training it resembles the overall pattern described previously for the M.T.E.s. However, because of the diversity of trades in the Air Branch the classes are generally smaller and the turn-over is at least three classes a week, sometimes six. In addition to the normal trade group courses shown on the promotion and advancement chart (FIG. 3) several familiarization courses are always being held to acquaint personnel with the new equipment.

THE LEADERSHIP SCHOOL

The Leadership School, at H.M.C.S. *Cornwallis*, runs courses continually throughout the year for petty officers, second class, and above (including newly promoted branch officers and other officers entered directly from civilian life or other services). The courses vary in length from two weeks for Reserve personnel to six weeks for regular chief petty officers and petty officers.

The Officer in Charge is a lieutenant-commander (Executive) his deputy an instructor lieutenant-commander and the course officers may be lieutenant-commanders or lieutenants of any Branch—as are the course instructors.

The long course was originally modelled on the R.N. equivalent at H.M.S. *Royal Arthur*, but has since been modified to include Canadian and U.S.N. ideas.

Briefly the courses consist of four phases of instruction :—

1. Leadership and development of leadership qualities
2. Divisional duties
3. General Service knowledge (etiquette, naval organization, N.A.T.O. etc.)
4. Additional related activities (sports, tours, etc.).

The courses are designed to fully occupy a 7-day week. Church on Sundays and evening sports are compulsory, and considerable private study is necessary to prepare essays, lectures, etc. One week-end's leave is granted in the middle of the 6-week course.

THE FUTURE

It is expected that the personnel structure of the R.C.N. will undergo some radical and perhaps startling changes in the near future. Although the report of the committee appointed to consider what form the future structure should take has not been made public, some of the changes may incorporate :—

1. Common entry for men
2. A new concept of user/maintainer functions to make the most efficient and economical use of manpower in ships, for example, there will not be separate Electrical and Ordnance Departments ; the Engineering Department will be responsible for power generation and distribution equipment, and the Weapons Department for electronic equipment connected with armament. There will still be a requirement for a limited number of highly skilled and specialized personnel, but in general user personnel will be expected to carry out more of the routine and simple maintenance tasks.
3. An officer structure more akin to that of the U.S. Navy than that recently introduced into the Royal Navy
4. A higher standard of recruiting together with a shorter initial engagement, designed to eliminate wastage and misfits.

CONCLUSION

Would the present personnel trade and rank structure of the Royal Canadian Navy be of advantage to the Royal Navy ? The answer to that is perhaps negative. The R.C.N. has already realized that even this structure is too rigid in trade and branch as suggested in the preceding section of this article. Whereas the tri-service arrangement of equal opportunity in rank and trade has many advantages, it is, for example, extremely debatable as to whether the personnel structure of a warship's complement can be compared on parallel lines with an infantry unit of similar manpower.

However, as far as the Engineering Branch is concerned, the existing trades structure is at least a realistic approach to modern conditions and it is quite evident that the operator/maintainer scheme is a success.

Finally, as this article has been concerned with R.C.N. Engineering Branch training, the conclusion one draws above all else is that the Royal Canadian Navy has an approach to the job of training a seaman which is both inspiring and vitally up-to-date.
