R.C.N. ENGINEERING BRANCH REORGANIZATION

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INTRODUCTION

This article deals with the reorganized trade structure of the Engineering Branch of the Royal Canadian Navy—why reorganization was necessary, how it was started, how it has progressed, and the results so far achieved.

Until recently, most ships of the Royal Canadian Navy had been constructed in the United Kingdom, or had been built in Canada from drawings supplied under agreements with the United Kingdom. These ships have presented their own operating and maintenance problems and have dictated the particular operating and maintenance techniques required by engineering staffs. The precedent in these matters has been set by experience in the Royal Navy, and, with the exception of certain changes in the rank structure to conform with the tri-Service structure of the Canadian Forces, no significant attempt had been made to modify the personnel organization, used in the Royal Navy, to meet the particular conditions existing in the Royal Canadian Navy.

Probably the most significant anomaly existed in the structure of the stoker mechanic trade, a group whose senior members comprise over fifty per cent of the supervisory personnel (petty officer, second class, and above) of the Engineering Branch. Their activities and number, dictated largely by the precedent established in coal-burning ships, had become an anachronism in the age of oil fuel, complex ship services and Diesel engines. The men themselves were, on the whole, earnest hardworking citizens, who did a good job when given a chance, but whose progress and usefulness was limited by the scope of employment permitted by their training. In addition to the dreary and monotonous field of employment, an injustice, which did not exist in any other branch of the Navy, precluded normal progression to commissioned rank.

On the other hand, the engine-room artificer had increasing cause for complaint in the ever-growing and, at times, overwhelming load imposed by the expanding requirements for ship services and the troubles arising from defective material often used in war-time construction, as well as other material deficiencies resulting from poor design. Further, concern was felt in the Personnel Branch of the Navy at the failure to obtain tradesmen with a suitable background from civil life, and, when these men were not obtainable, at the length of time involved in training highly qualified tradesmen in naval schools. These two factors could effectively preclude a rapid expansion of the Fleet in an emergency if an alternative solution could not be found.

These factors involving personnel, in themselves demanded a revision of the personnel structure of the Engineering Branch, but developments on the materiel side presented even more evidence to support the fact that the whole problem of employing the man-power of the branch required a fresh approach. The Korean situation, and the resulting expansion of production facilities for naval machinery of advanced design, indicated that past methods of organization, training and the employment of engineering staffs in the new ships would require revision, if the new and complex machinery was to be operated and maintained successfully.

MATERIEL REQUIREMENTS

The fundamental trend in design is to replace a machine which is obsolete with one which is lighter, which occupies less space, is more efficient, and has improved elements for its own control. This has eased the operating requirement but has complicated maintenance.

Another very marked tendency is the use, in ever-increasing degree in the construction of large machines, those quantity-production techniques which are used in the manufacture of small, high-speed machines. This trend, in turn, requires standardization of machinery parts. Machinery components, because of the close tolerances used in quantity-production, can be repaired by the replacement of their elements. This permits the employment for maintenance, of personnel who need not be as highly qualified as is necessary when the maintenance function requires manufacturing skill.

PERSONNEL REQUIREMENTS

As evidence to support a revision in the employment of Engineering Branch personnel was accumulating, a ' Job Analysis Program ' was undertaken, to determine how men in each trade were being employed in order to standardize, if possible, the trade structure and to ensure adequate training, There was also a requirement to establish a firm basis for an additional allowance for trade pay. This program, initiated in 1950, was conducted in close liaison with the other Services and the Federal Department of Labour. During this study, some forty per cent of the men in the Navy filled in scientifically designed questionnaires. The fundamental questions asked were ' What do you do ? ' : ' How do you do it ? ' : 'Why ? '

As a result of this study, it was possible to assess scientifically the construction of each trade, and to determine improvements in the methods of training and employment for the men. It became apparent that there had been a lot of ' woolly ' thinking in the past concerning how the tradesman should be employed. Even the nomenclature pertaining to trades and branches was not clear ; for example, the ' Stoker Mechanic Branch of the Engine-Room Branch '. It was apparent that the duties performed in the technical trades of the Navy could be separated into three functions : operator, maintainer, and manufacturer. Certain trades were occupied mainly with one function, others with two, and some with all three.

With particular reference to the Engine-Room Branch, the following general conclusions were reached. The Engine-Room Branch consisted of what were essentially two trades, namely the stoker mechanic trade, the significant function of which was auxiliary machinery and boiler operation only, and the engine-room artificer trade, the function of which was operation, maintenance and manufacture. As half the supervisory personnel, i.e. men of the ranks of petty officer, second class, and above were of the stoker mechanic trade, it was apparent that of the two trades, a man in the engine-room artificer trade was much more intensively occupied than were his associates in the stoker mechanic trade. It was also apparent that there was no good reason why men of the stoker mechanic trade, who already had experience in auxiliary machinery and boiler operation, could not, in a relatively short time, be taught to carry out maintenance on that and other equipment and, with further experience, become qualified to carry out operating duties with main machinery and, later, take charge of the personnel and materiel involved in machinery installations. If a system which would permit the qualification of stoker mechanics as operator-maintainers could be instituted and successfully concluded, the maintenance personnel of the Engineering Branch would be doubled.

A further requirement to be met was caused by the trend towards complicated machinery. Because of the limitations imposed by training requirements, particularly in an emergency, it is necessary to simplify complicated operations by specialization. This permits a man with limited education and experience to absorb the necessary skill of his specialization in a minimum time. The physical limitation of space on board ship precludes a comprehensive division into specializations, consequently there is a limit to the degree in which naval trades can be specialized. It was apparent that in the Engine-Room Branch, three specializations could logically be adopted. These would be determined by the three significant prime-movers, i.e. turbine, steam-reciprocating and Diesel.

The complications of drafting and manning were considered to be acceptable in view of the saving in time which would accrue in training men in the more limited aspects of specialized employment afloat. Machine-sorted punched-card systems of record keeping would permit individuals in the specializations to be easily identified and located and would largely remove the record-keeping objections to specialization. Because the operating and maintenance problems in the specialities become common at the higher supervisory levels, they could be combined at the charge level.

When these various considerations had been presented to the Naval Board in the form of recommendations, it was decided to reorganize the Engine-Room Branch and initiate a program of qualifying stoker mechanics as operator-maintainers. At the same time, it was decided to re-define the duties of personnel employed in the Engine-Room Branch. Accordingly, the term ' Engine-Room Branch ' was changed to ' Engineering Branch ' ; the term ' Engine-Room Artificer ' to ' Engineering Artificer ', and ' Stoker Mechanic ' to 'Engineering Mechanic ', and arrangements were made to permit specialization and certification in the three types of prime-movers. The program which initiated this action was put into effect on 16th July, 1953.

ENGINEERING BRANCH REORGANIZATION

The significant changes in the personnel organization of the Engineering Branch brought about by the reorganization are :—

(*a*) Conversion of men of the rank of petty officer, second class, and above of the stoker mechanic trade from operator to operator-maintainer, and re-designation of all men of the stoker mechanic trade as engineering mechanics.

(*b*) Specialization in turbine, steam reciprocating or Diesel operation with progression to the highest rank and trade group in any or all of the specializations.

(*c*) Elimination of E.R.A. candidates, and the complications of transfer from the old S.M. to E.R. trades.

(*d*) Introduction of trade courses to impart increased maintenance skills at the Trade Group 1, 2 and 3 levels.

One of the most important problems was converting the operators, who previously constituted the stoker mechanic trade, to the operator-maintainer qualification. This was accomplished by devising a course consisting mainly of skill of hand projects supplemented by actual refit work from ships defect lists. The duration of this course was set at 600 hours. This program, which was estimated to require 300,000 training man-hours, provided many problems in extracting candidates from the fleet and in determining who should have priority in being converted. The fleet was still expanding and there were shortages of personnel in all categories but the required build-up of eighty

candidates for the first six Conversion Courses was attained. This number has been maintained continually since then, so that at present over ninety per cent of the program is complete.

TRAINING

It has also become apparent, during these investigations, that a considerable review of ideas was necessary concerning the facilities for training and the amount of space allocated to them, which was, under the new conditions, too limited to accommodate the increased fitting shop requirement for maintainer training. Accordingly, plans were drawn up to enlarge the Mechanical Training Establishment in the Halifax Port Division, and to construct a new Mechanical Training Establishment in the Esquimalt Port Division. The scope of the latter establishment has been enlarged to accommodate training in the Pacific Command for all the technical branches. These plans are progressing favourably. It was decided at this time to improve training methods at all levels, and new syllabuses were promulgated for the basic, intermediate and higher levels, and arrangements were made to improve the quality of training aids, methods of instruction and facilities. Wall charts have been superceded by transparencies produced by a Kodachrome photographic process and recorded lectures on various topics are being produced, which refer to the visual material. These lectures serve as a guide to live instructors or could serve in the place of an instructor when a qualified instructor is not available. This permits standardization of instruction in the various training establishments and throughout the twenty-two Reserve Divisions. Components of modern machinery, such as pumps, blowers, steering gear, are being obtained for instructional purposes, and operating Diesel shops containing the latest engines, loaded by dynamometer, are being provided in each establishment. A complete refrigeration and air-conditioning plant, and a Bailey Meter combustion-control apparatus are also being installed.

A proposal for a steam-operated training plant to contain one set of main machinery of advanced design, loaded by dynamometer and capable of simulating normal and emergency operating conditions, has been approved by the Naval Board. This machinery will allow a crew of the new ships, propelled by prime-movers of advanced design, to be trained as a team before being drafted to the ship.

So that skill of hand and maintainer training can be more realistic, the practice of obtaining items from ships refit lists has been expanded, and complete pumps and small turbo auxiliaries are removed from the ships, transported to the Mechanical Training Establishment, refitted, re-installed and supervised during trials by trainees and instructors. Classes also undertake items which must be done on board ship. It is intended to expand this program still further and to the refit of Diesel engines which are removed for repair by replacement. Arrangements have been made in the layout of the Diesel operating training shops to permit such engines to be run on dynamometers under full load after refit, to prove that they meet specifications.

As a result of the increased scope of employment for engineering mechanics, it has been necessary to define more carefully the duties of engineering artificers. The field of employment for this trade has not been changed, and includes operator-maintainer and manufacturing duties. Because of the superior training in skill-of-hand of these tradesmen, their employment in the more complicated aspects of maintenance and manufacturing activities will continue, i.e. machine shop, being a direct responsibility. The range of supervisory duties of these tradesmen has been extended, and engineering artificers in the chief petty officer ranks can expect to undertake more of the personnel supervisory duties formerly undertaken by the chief stoker. In fact, the man in charge of

any maintenance or operating activity will be completely responsible for both phases of the activity—personnel and technical.

The administrative organization of the Engineering Department in small ships will now consist of the Engineer Officer, assisted by the senior engineering chief petty officer, who will perform the duties commonly associated with the Senior Engineer in large ships. His predominant function will be the control of personnel and, through his departmental chief petty officers, the control of the technical aspects of operation and maintenance of the main propulsion plant. Other chief petty officers will have direct charge of the boilers, engines and auxiliary services. The duties of the Regulating Chief Stoker have been included with those of the Regulating Chief E.R.A. in the more comprehensive personnel control performed by the Senior Engineering Chief Petty Officer.

RANK AND TRADE

While the Engineering Branch reorganization has been progressing, another significant change in the personnel organization of the Navy as a whole has also been proceeding. This has had its effect on the Engineering Branch, and has served to enhance many of the aims of the branch reorganization, by establishing the proper status of the senior men of the branch.

There has been a fundamental problem in rewarding skilled tradesmen for their progress in the technical aspects of their duties. Centuries of precedent have decreed that officers and men progress in rank, and as a result, obtain authority over other men as they accumulate experience and knowledge. This concept has been complicated by the introduction of technological devices in that a man may now gain considerable and invaluable experience and knowledge of mechanical devices but is not equipped by experience, and possibly by ability, to exercise authority over groups of men. The problem of acknowledging the attributes of these men by awarding rank, without diminishing the significance of rank, has been one of the most difficult to resolve.

The three Canadian Armed Forces, by introducing a system of trade groups with substantial increments of pay, awarded on acquiring each of four trade group levels, have made it possible to reward men for progress in their trade. Progress in rank can be restricted to those persons who demonstrate the ability to take charge of groups of persons employed in performing some activity. In the case of men of the Engineering Branch, trade groups are awarded for trade knowledge, as in all other trades of the Navy, and rank is awarded upon proof, by examination and demonstration, of the ability to take charge of the men and machines involved in supplying ships services and main propulsion. There is some difficulty in separating the rank and trade functions at the group four level but, essentially, a man can progress to the rank of petty officer, second class, largely on his trade acquirements. To progress to petty officer, first class, and later to chief petty officer, he must prove his ability to take charge of the personnel involved in the operation of boiler rooms, engine rooms, the steaming watch in large ships, and the Engineering Department of small ships.

These concepts cannot be introduced at the stroke of a pen, but they are now embodied in complements of ships and in all training syllabuses.

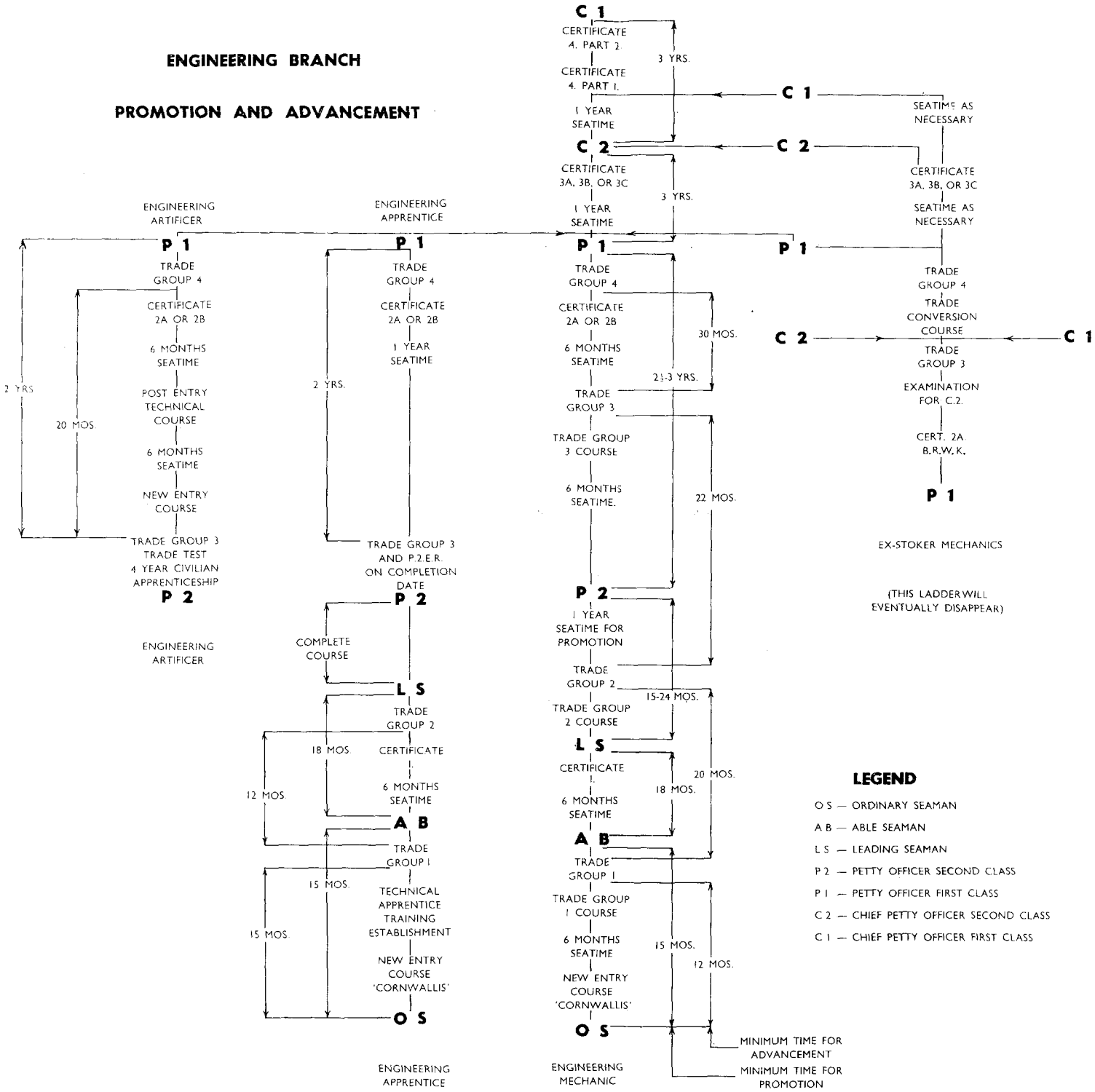
A schematic representation of the path of advancement and promotion is shown in the Figure.

RESULTS

There has not, as yet, been time to assess the final results of the Branch reorganization because the complements of ships (with the exception of the new destroyer escorts) still contain remnants of the old system. However, reports to date indicate that those senior engineering mechanics who have undertaken the

ENGINEERING BRANCH

PROMOTION AND ADVANCEMENT



LEGEND

O S — ORDINARY SEAMAN

A B — ABLE SEAMAN

L S — LEADING SEAMAN

P 2 — PETTY OFFICER SECOND CLASS

P 1 — PETTY OFFICER FIRST CLASS

C 2 — CHIEF PETTY OFFICER SECOND CLASS

C 1 — CHIEF PETTY OFFICER FIRST CLASS

trade conversion course and have gone to sea to obtain their engineering watchkeeping qualification have, with very few exceptions, succeeded in justifying the plans made for improving the range of their employment. As may be expected, these men acquire operating knowledge more readily than the maintainer skills and knowledge, but with practice and experience, and the resulting confidence in their own abilities, they have been able to meet the maintainer requirements of the Engineering Department.

The crews for the new destroyer escorts are being made up of operator-maintainers only. The results of this policy will not be known for some time, but interim reports on the results of employing the first crew are very encouraging. One of the most important results being reported concerns the improved morale of the men of the ex-Stoker Mechanic Trade.