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Cover: This is an unofficial MARE crest which originated in the DGMEM organization. You are encouraged to comment on this crest, suggest improvements, and/or submit a completely new design. All input will be considered and an official MARE crest will be completed and submitted for approval.

Couverture: Représente un projet non officiel d'écusson du G Mar, créé par le DGGMM. Les lecteurs sont vivement encouragés à exprimer leurs commentaires sur ce projet d'écuss, à suggérer toute amélioration ou nouvelle formule qui leur semblerait souhaitable. Il sera tenu compte de tous les avis et, pour finir, un écusson officiel sera retenu et soumis à approbation.

Contents

MARITIME ENGINEERING JOURNAL

Editor's Notes

MARITIME ENGINEERING JOURNAL
SUMMER EDITION, AUGUST 1984

This edition of the MARE Journal contains the second in a series of articles on the CPF. The article was written by Capt(N) Peter Child and is entitled "Project Management Systems Employed on the the CPF Project". Future articles will describe in detail the various systems that will allow the vessel to meet her operational requirement.

Also contained in this edition are a couple of articles devoted to personnel matters and are in fact condensed versions of the briefs presented at the Professional Development Seminars this past May and June. Capt(N) Broughton's article on the MARE "Get Well Program" states the positive things that have been happening to bring our classification up to strength after ten lean years. Cdr May has put a great deal of work into producing the MS training and development plan which is described in the second article.

Again I invite our readers to use the MARE Journal to express their opinions and ideas. If you agree, disagree, see a better way ahead for the classification or just want to comment, write a letter to the Editor. Better yet, write an article to be published.

This will be my last issue as Chief Editor. I would therefore like to thank those dedicated officers who put together each issue. The MARE Journal has improved many fold over the last few years and the staff have earned a hearty "well done". I wish them well in future issues, and I ask our readers to support them with articles and letters to the Editor.

I would like to pay tribute to Commodore E.C. Ball for his advice and guidance since the founding of the Journal. He gave the staff the right combination of direction and encouragement which has resulted in the current quality publication. All the members of the staff wish the Commodore well in his future endeavours as he turns over the reins of DGMEM to Commodore J.A. Gruber.

Letters to the Editor

MARITIME ENGINEERING JOURNAL

In 1982, we produced our first publication of the MARE Journal. I was involved in that publication and the staff work leading to its implementation. No one was more pessimistic than I on its continued success. I felt that few MARE's would support it and thus it would not thrive as an active platform for MARE discussions. At that time, I discussed previous MARE Journal ventures with the older folks in NDHQ who recalled numerous attempts that failed through lack of support. Although I am pleased to see where we are today after two and a half years of development and four editions under our belt, I am still concerned.

I want to take this opportunity to express my appreciation to the MARE Journal editorial staff for a job well done. The fourth edition is a high quality publication with lots of meat between the covers. I particularly found the articles by Cmdre Ross, Cdr Scholey and Cdr Leonais to be excellent and thought provoking. I believe we could all pick up on their subjects and provide good artilcles for future Journals. In particular, Cdr Leonais' provides a jumping off point in many directions for a number of articles.

I wish to point out to all your readers that the Journal is ours and therefore an excellent form to express our MARE/NAVY opinions. I encourage all MARE's to write for the Journal (articles, letters and book reports) because the staff in NDHQ cannot do it alone. Without input from across the country, the Journal will not survive.

R.J. Rhodenizer
Commander
Naval Engineering Programmes Officer

THE MARE CLASSIFICATION SPECIFICATION

I read with interest the excellent article by Cdr Scholey in the Feb '84 issue, and wish to commend him for a lucid explanation of these basic documents. For most officers, the article may well give the first knowledge that there are, in fact, specifications which describe the skills and knowledge that we are expected to possess.

I would add that, in addition to the MARE Classification and the Sub-classification specifications, there are Officer General Specifications which describe the more general duties, skills and knowledge expected of all CF officers. The BOTC training, for example, is designed to produce an officer candidate meeting the Basic OGS.

To further put the article into perspective, it is important to understand where we are coming from. The MS specs which are being superceded are twofold: the Basic spec describes only one duty - that of EOOW; and the Advanced spec also describes only one duty - that of EO. Since we have no established jobs for officers as EOOW, and since there are more "advanced" jobs than just EO, there was a need to change, from an officer specification viewpoint.

Cdr Scholey made much mention of the impact of the spec change on the EO position - and rightly so, since it is an important job. I would take exception to one statement he made, however, that "...the position of ships' engineer officer is treated as a job just like any other...", on two counts. Firstly, one cannot tell by reading the new specification how any job is "treated", since the spec describes the officer's skills and knowledge requirements for the first day of the first job. Secondly, the revised MS Training and Development Plan (of which Cdr Scholey was presumably not aware when he put pen to paper) continues to recognize the EO's "traditional elevated status of the past". The enclosed article, describing the Plan, is herewith submitted for publication in hopes that some of the developing misconceptions can be put to rest.

One final word: I am extremely pleased to see the MARE Journal publishing personnel and training-related articles in addition to technical ones. These are subjects worthy of discussion and understanding in any profession. Keep up the good work!

Cdr R.G. May
DMEE 2

There are two items I would like to comment on from the Winter Edition 1984. The first is an inaccuracy in your Editor's Notes. I consider myself a "brethren on the coast" (sic) and my paper "An In-Line Speed Change Gear Unit" appeared in the Summer 1983 Edition.

I was very interested in Commodore Ross's contribution in Commodore's Corner. The section dealing with the quandary of the sea-going engineer, professional engineer, and manager at the bottom of page vii is a difficult one. As he aptly points out, each officer cannot do a job of each type at each rank level; however, in my opinion, the mix of employment is important to the MARE Classification. The alternative is to convert SPQRs to a plethora of sub-sub-Classifications each buried in their own little niche. Commodore Ross points out the conflict between MARS and MARE despite both being part of the Naval Operations Branch. Creation of what are essentially sub-sub-Classifications within the MARE community by not maintaining a mix of employment will only serve to create additional conflicts which would be Classification disruptive rather than Branch disruptive.

Something which your Editor's Notes in the Winter Edition could be taken as alluding to is an "us and them" attitude which can develop between one coast and the other coast and NDHQ. An employment pattern for MAREs based on sub-sub-Classification niches which does not maintain mobility between coasts and NDHQ will just exacerbate the "us and them" attitude to the detriment of the Classification.

L.T. Taylor
Special Projects Officer
Naval Engineering Unit (Atlantic)

Commodore's Corner

BY COMMODORE E.C. BALL

It will come to you as no surprise that, after 32 years in the Navy and on completion of 4 years (one of the longest tenures on record) as DGMEM and Naval Operations Branch Co-Adviser (MARE), I am looking back on what has been accomplished despite some of the great trauma of organizational upheaval, changing naval acquisition strategy and the chronic shortage of resources which we have experienced in recent years.

One thing shines through above all! Those who accomplished things of lasting value - to the Navy by way of sustained and improved fighting capability; to themselves by way of that fine sense of realization, of fulfillment that comes from the evidence that their efforts have contributed to the good of all - did so by pursuing long-term values and visions which rendered the endlessly changing policy environment no greater than the equally endless heaving and tossing of the sea or the variability in intensity and direction of the wind. To the seaman, both are inevitable. To the movement of the sea he adapts; to the variability of the wind, he sets his course and trims his sails so that his progress to his overall goal is ever optimal even though his path be tortuous and his speed-made-good a variable to the end.

Whether it is in our personal lives or in our calling as naval officers and engineers in that naval context, I recommend we look to our long-term values (our ethos, if you will) and our objectives. They are among the few things that change little in a world fraught with the continuous challenge to change and to adapt. Those values and objectives are well articulated in the MARE Role Statement handed out at the recent personnel development seminar and imbedded in the rewritten MARE Classification Specifications. The maintenance and improvement of the operational availability and capability of our ships and their equipment have always been our goals. The challenges are countless and the rewards limitless if we can avoid becoming dismayed.

Our great good wishes go to Commodore Gruber in his new job as our Branch Adviser. My great thanks go to you all for your splendid loyalty and support.

MARE TRAINING TO CLASSIFICATION QUALIFICATION (MOC 44A)

EDITOR'S NOTE:

The following article is a condensed version of the NOTC briefing given at the Professional Development Seminars and is included as background for Capt(N) Broughton's and Cdr May's papers.

INTRODUCTION

This brief outlines the training of Maritime Engineers to classification level which will be effected this summer. It also touches on what the training has been to date and the factors that have led to the changes.

TRAINING PHASES

The MARE Classification is an integral part of the Naval Operations Branch. Thus a good portion of a MARE officer's early training must be in common with that of his MARS brethren to prepare him for his collateral role as a naval officer. The training involves four distinct phases, as shown in Figure 1. The first takes place at the Canadian Forces Officer Candidate School, Chilliwack, and is common to all officer candidates. Phases two, three, and four take place at VENTURE, the Naval Officer Training Centre, whose primary role is to train all naval officers (MARS and MARE) to classification qualification level. These latter phases involve much training that is common to both classifications.

All persons who aspire to become officers of the Canadian Forces must meet certain basic and common requirements before proceeding to undertake training related to their military classification. Basic requirements are stated in the Officer General Specification (OGS) promulgated in CFP 150(1). Length of training varies by method of entry.

BASIC OFFICER TRAINING COURSE

Basic officer training for officers is conducted at the Canadian Forces Officer Candidate School (CFOCS). The Basic Officer Training Course (BOTC) has been designed to introduce officer candidates to the military environment, and to motivate, teach and develop the candidate in basic military leadership, military skills and knowledge. The BOTC thus provides potential officers to the Canadian Forces with:

a. instruction in those military skills and knowledge areas common to all officers;

b. opportunities to learn and practice leadership, emphasizing self-confidence, determination and teamwork; and

c. guidance in the development of officer-like qualities.

BASIC NAVAL OFFICER TRAINING

The next phase is Basic Naval Officer Training, and is common to both MARS and MARE. It consists of eight weeks of training as follows: three weeks of classroom training; three days at sea in general purpose yardcraft; and four weeks at sea in destroyers. This phase concentrates on introducing the trainee to the navy and to shipboard life. For the ROTP trainee this may be the first insight after some 3 years of military service into his chosen profession. For most DEO/OCTP trainees this phase marks their first taste of naval life after 13 weeks of BOTC. The skills and knowledge levels attained are limited with the exception of the development of a detailed knowledge of small boat handling, firefighting and damage control techniques.

BASIC MARITIME ENGINEERING TRAINING

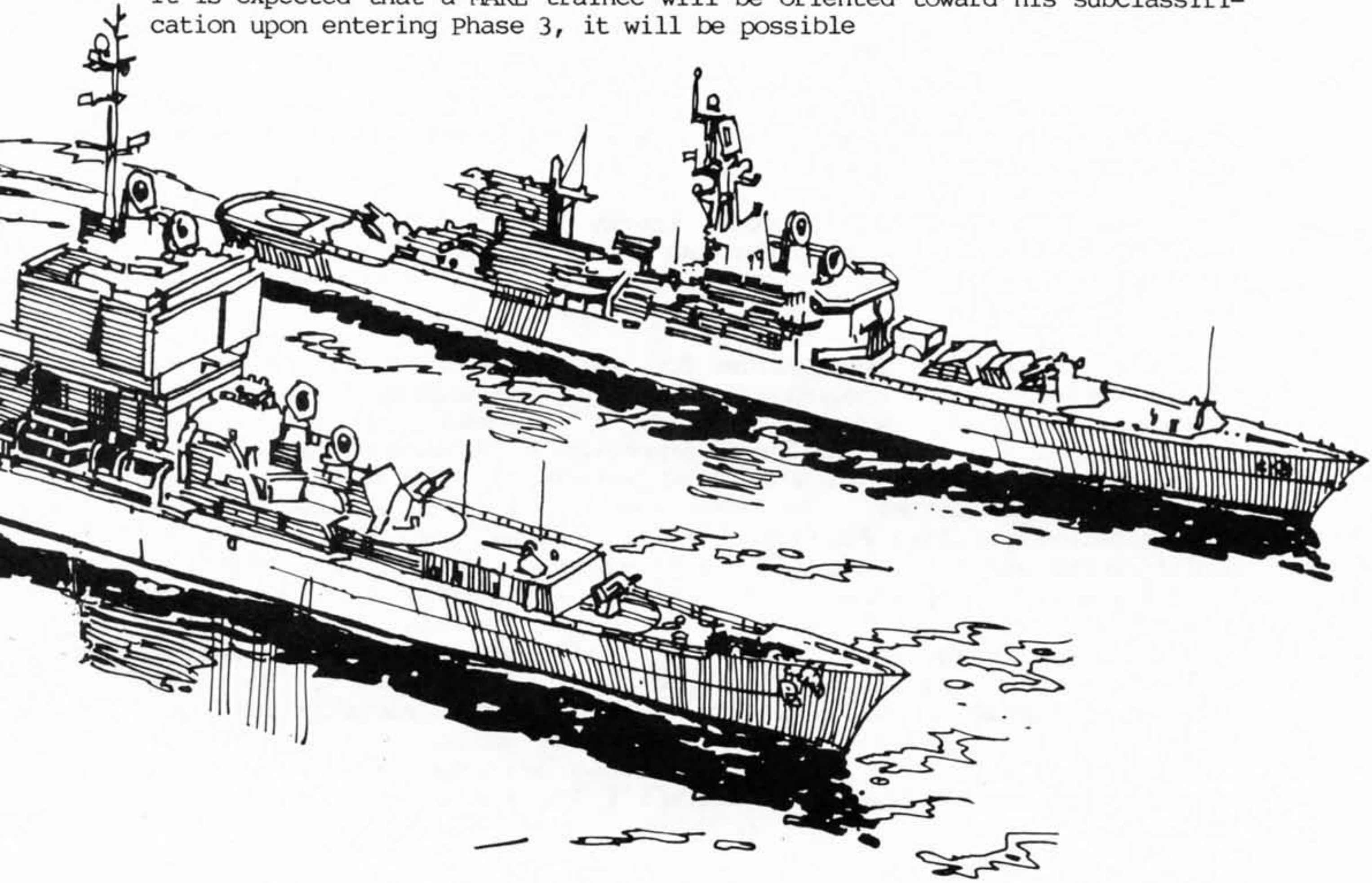
Phase 3 is entitled Basic Maritime Engineering Training and introduces the MARE trainee to both his classification and intended subclassification. Until this year, trainees commenced their singular subclassification training at the Phase 3 level. Future training will involve a large measure of common training to be consistent with a common Classification level. Hence, the format of Phase 3 training will involve three weeks of instruction in VENTURE followed immediately by five weeks of on-the-job training consolidation in a warship. Of the three weeks instruction in VENTURE, one week will be devoted to common core subjects while the remaining two weeks will present the trainee with subclassification generic subjects. In the warship, two of the five weeks will entail common performance objectives while the remaining three weeks will focus specifically on subclassification performance objectives.

The purpose of Phase 3 training is:

"To provide all MARE trainees with a common understanding and appreciation of fleet engineering organizations and those technical applications in warships that are of common interest to all Maritime Engineering subclassifications; and

To introduce MARE trainees...to a typical warship's (engineering) department and the fundamental equipment/systems employed therein."

Note the emphasis on <u>introduction</u> as opposed to specific knowledge/ skill achievements for a subclassification. This is significant because, although it is expected that a MARE trainee will be oriented toward his subclassification upon entering Phase 3, it will be possible



for him to switch to another after completing Phase 3. Normally, in such cases, a trainee will not have to repeat Phase 3. Of course, he will be at an initial disadvantage to his peers who have continued in one subclassification, but if he has the motivation and personal resources to merit a switch, he will make up the difference during Phase 4.

Phase 3 training will occur normally in the summer between the third and fourth academic years for ROTP candidates, and immediately after Phase 2 training for DEO candidates.

MARITIME ENGINEERING CLASSIFICATION TRAINING

Phase 4 is entitled Maritime Engineering Classification Training. This phase comprises, in general, three elements:

a. Phase 4 Common training;

b. Maritime Engineering Classification Basic Course (MARE Basic); and

c. Phase 4 training afloat.

Phase 4 Common training remains as it has been for both MARS and MARE officers. This course is designed to prepare all naval officers to pursue their Officer-of-the-Day qualification.

The MARE Classification Basic Course is a new course, four weeks long. It is designed to impart the common core of knowledge and skills that all MARE officers require to function effectively at the classification level.

The fundamental prerequisites for MARE classification qualification are Officer-of-the-Day knowledge and skills, and engineering management knowledge and skills. Achievement of the Officer-of-the-Day qualification in a warship will satisfy the former prerequisite; successful completion of the MARE Basic Course and a few selected performance objectives in a warship will satisfy the latter. In other words, all MARE trainees will be classification qualified when they have been awarded the Officer-of-the-Day qualification and have completed the performance objectives. The time necessary for this achievement will vary with the individual and the ship's circumstances but, on average, three to four months is a realistic timeframe. As in the case of Phase 3, it will be possible for a trainee to switch to another subclassification upon completion of Phase 4. Each case will be considered on its own merit. Such a person normally would not repeat Phase 4 which, after all, serves mainly to achieve classification qualification, but he would likely be burdened with completing a number of subclassification performance objectives which are being added to this phase.

The revised training will:

a. provide desired commonality in preclassification level instruction and training;

b. remove unnecessary qualifications;

c. effect a necessary reduction in training time and resources; and

d. allow flexibility for junior MAREs to find their best-suited Subclassification before too much Subclassification training is completed.

MS SUBCLASSIFICATION TRAINING & DEVELOPMENT

AUTHOR CDR R.G. MAY

Cdr May is in his 26th year of service, during which time be has been EO of destroyers in operational and training roles, and Squadron Technical Officer of DESRON Two. Ashore, he was CO of the Naval Engineering Test Establishment, served in the NEUs on both coasts, attended Staff College, and was Production Officer in SRU(P). He is in his second posting to NDHQ, where he is Section Head in DMEE 2, the Prime Movers section. Collateral to his Section Head duties, he has been heavily involved in the MARE Study activity, and is a principal adviser on matters relating to the professional development of Marine Systems officers.

EDITOR'S NOTE:

This article is taken from the text of the MS Training and Development briefing given by Cdr May at this year's MARE Professional Development seminars. It is reprinted here for the benefit of those who could not attend the Seminars, and to place in print an explanation of the training plan being implemented for MS officers. Readers will find it a useful follow-on from the articles by Cmdre Ross and Cdr Scholey in the last edition of this Journal, and that by Capt(N) Barrett in the Summer '83 edition.

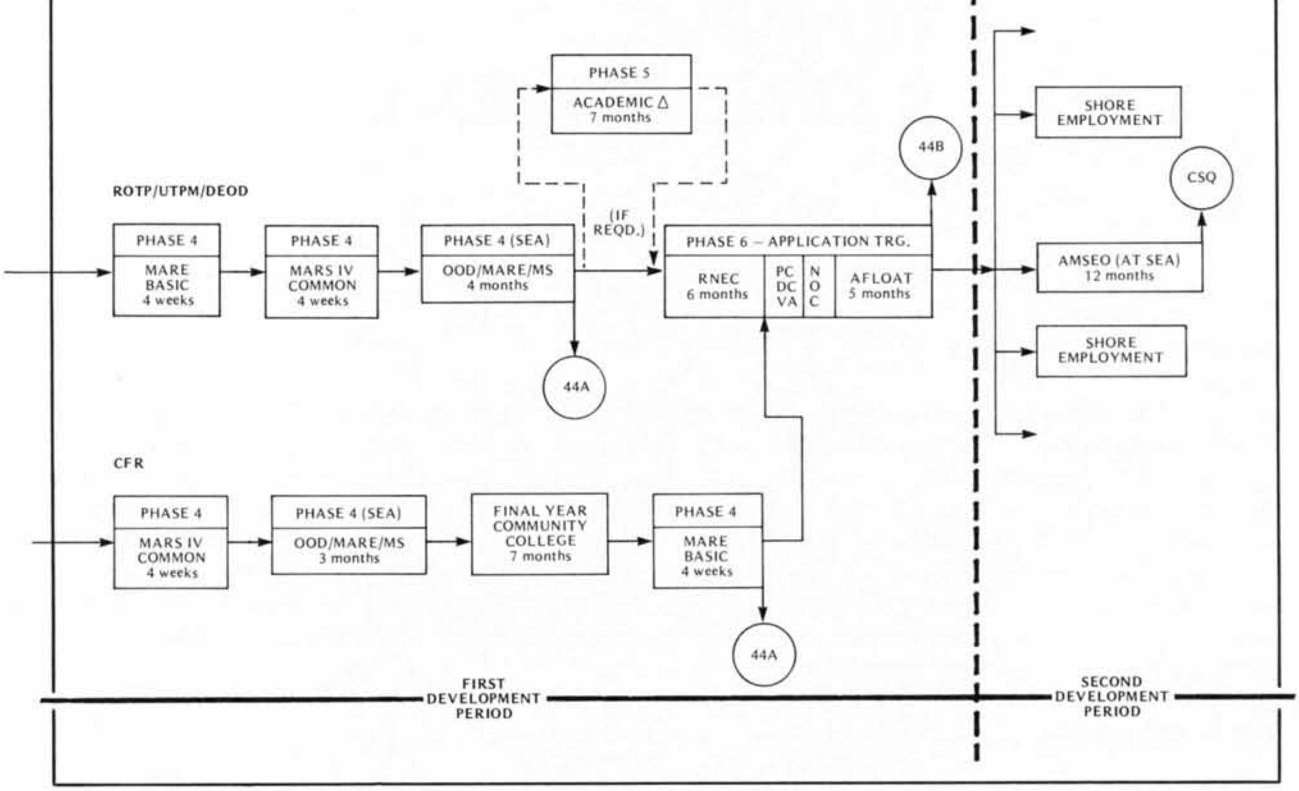
INTRODUCTION

The previous article summarized how we will produce 44A qualified officers. This article will begin at the final phase leading to 44A and then explain the steps in the training plan leading to the award of the 44B qualification. Finally, it will explain some aspects of employment in the Second Development Period, including the position of Assistant EO afloat.

The MS portion of the training plan (see Figure 1) shows the plan from the latter portion of 44A training through to the end of 44B training and on into the Second Development Period. I should emphasize that <u>training</u> stops with the award of 44B, ending the First Development Period. Later activity is in the <u>Second</u> Development Period, and is concerned with employment and development. In other words, your <u>training</u> is over when you achieve 44B and you are deemed <u>employable</u> as a Marine Systems engineer from that point onward. Some jobs will need extra coursing or other development

MS TRAINING AND DEVELOPMENT PLAN

FIGURE 1



activities, but from the viewpoint of the navy your basic training is complete and you are employable.

PHASE FOUR

In Phase 4 (summarized in Figure 2), officers will have been given a knowledge of what Maritime Engineers do by the MARE Basic Course and MARE Common OJPRs at sea. They will also have developed along naval officer lines by becoming Officer of the Day in a warship. With this level of knowledge, an officer could be employed in certain junior positions that do not require marine systems-specific knowledge or skills. Also the award of 44A renders an officer promotable to sub-lieutenant (a "green machine" requirement) and ensures he doesn't suffer in this regard with respect to his peers in other classifications.

We expect that officers will have some time during this phase to pursue their more specific interest in marine systems engineering, and to that end we will inject some MS-specific OJPRs designed to introduce officers to the MS world and prepare them for the next phase in their training - the Marine Engineering Application Course (MEAC) at RNEC Manadon. Our intent is to have officers become familiar with machinery and systems in their ships during this phase so that they will better grasp the classroom material presented to them during the MEAC. Note that this is a change from the way we currently train our MS officers.

PHASE 4 (SEA)

FIGURE 2

PURPOSE	– COMPLETE CLASSIFICATION QUALIFICATION (44A)
PREREQUISITES	– MARE BASIC COURSE – MARS IV COMMON
METHOD	– OOD QUALIFICATION – MARE COMMON OJPR
LOCATION	– TRAINING SQUADRON
DURATION	– 4 MONTHS (3 MO FOR CFR)
COMMENT	– MS OJPR DESIRABLE PRE-RNEC ADDED – YIELDS PROMOTION TO SLT IN REASONABLE TIME – LOGIC OF NAVAL AND MARE COMMON TRAINING BEFORE SUB CLASSIFICATION TRAINING

PHASE 5 – ACADEMIC UPGRADE

FIGURE 3

PURPOSE	– PROVIDE ESSENTIAL THEORETICAL KNOWLEDGE LACKING IN MS CANDIDATES
PREREQUISITES	– PREVIOUS DEGREE – CLASSIFICATION QUALIFICATION (44A)
METHOD	– "MATURE STUDENT" STUDY OF REQUIRED SUBJECT(S) TO DEGREE LEVEL
LOCATION	– UNIVERSITY
DURATION	– MAXIMUM 1 ACADEMIC YEAR
COMMENT	– "PRICE TO PAY" FOR RECRUITING SHORTFALL – PRECEDES APPLICATION TRAINING – YIELDS ALL MS WITH SIMILAR KNOWLEDGE CORE

PHASE FIVE

Now I would like to explain Phase 5 shown on the training plan and summarized in Figure 3. This is a phase which, in an ideal world, we would not have to use, but it is a recognition that we must bend at the recruiting door and sometimes enroll people with a less than complete academic make-up.

We are identifying, for degree officers, the core academic knowledge which is essential to the practice of marine systems engineering. We will make every effort to ensure that the Service College graduates and Direct Entry candidates possess this core knowledge when we get them. Where a subject is lacking, however, an officer would have a hard time grasping the material presented to him during his conversion to marine systems engineer. To overcome this basic shortfall, we propose a return to university for no more than one academic year to ensure the officer has a degree level of knowledge in the required subjects. Note that the purpose of this phase is not to give the officer another degree; it is to ensure he has the required knowledge, at the right level, so that he is equipped to pursue his training and career in marine systems engineering.

Phase 5 is located after 44A in the training plan because the subject requirements differ for the different MARE sub-classifications (for example, the CS officers have a lesser need for thermodynamics than do MS officers). It must be completed before Application Training since the academic knowledge must be possessed before it can be related to marine systems practice.

APPLICATION TRAINING – PHASE SIX

At this point in the training plan we will have an officer with common naval and MARE training, an introduction to the world of marine systems engineering, and a common core of related theory. The task now is to convert this officer into a marine systems engineer. The process by which we do this is called Application Training, wherein a basic engineer is exposed to the practical applications of his knowledge in the marine systems world. Once this transition is completed, the end product is a junior engineer qualified in marine systems engineering. At <u>this</u> point we accept the officer as a member of our sub-classification by awarding the 44B designation. The proper design and implementation of Application Training is the most important professional development activity being undertaken by the MS community today.

a. <u>MEAC:</u>

The first element is the Marine Engineering Application Course (MEAC) at RNEC Manadon (summarized in Figure 4). This is a shore course which provides the classroom and shop-floor portion of the transition to marine systems engineering. It reviews the

PHASE 6 (SHORE) – APPLICATION TRAINING RNEC MANADON

FIGURE 4

PURPOSE	– INITIATE TRANSFORMATION OF ACADEMIC KNOWLEDGE TO MARINE SYSTEMS ENGINEERING
PREREQUISITES	– CLASSIFICATION QUALIFICATION (44A) – ACADEMIC UPGRADE (IF REQUIRED) – MS SUB CLASSIFICATION SELECTED
METHOD	– SHORE COURSE IN PRACTICAL MS APPLICATIONS
LOCATION	– PLYMOUTH, U.K.
DURATION	– 6 MONTHS (CANADIAN VERSION)
COMMENT	– NOT NEEDED BY CFR WITH EXPERIENCE AND TECHNOLOGIST DIPLOMA – FOLLOWED BY EOPC, NBCD, VA, NOC – PRECEDES AT-SEA CONSOLIDATION

relevant theory and addresses the shipboard applications of that theory, covering the whole range from propulsion and auxiliary systems to individual equipments and components. Graduates will emerge with a good top-down understanding of the hardware and systems which create the basis of their later professional undertakings.

Probably the most significant change we currently have in hand is in the timing of the course. Those of you who have already gone this route did so after spending a year at sea getting your Engineering Watchkeeping Certificates. In essence, you pursued the consolidation portion of your training before taking the classroom portion. The revised plan corrects the logic of the timing, ensuring that the classroom training precedes the at-sea consolidation and experience element. The RNEC staff endorse this move since they have always found it difficult to address two different experience levels in their students.

The MEAC duration is currently 8-1/2 months. We have listened to the several complaints about non-relevant material and have thoroughly examined the MEAC syllabus. We approached RNEC with a proposal to delete material we Canadians can't use, and made several suggestions for addition of Canadian examples to the material we wish to retain. Also, we analyzed the benefits of the "Design and Make" project which accounts for 19% of the course timetable. Measured against our need to train systems engineers (not shop-floor technicians), we saw marginal benefit from the "Make" portion of the project, and have discussed a "Design" project, of lesser duration, to take its place. The project would comprise a system level SHIPALT design based on actual or proposed Canadian naval installations. The Manadon staff have agreed to try doing it our way, running an all-Canadian class starting in October of this year. The course duration will be just over six months - and, yes, you will still be able to take your wife and family. We expect that a full class of 20 officers will attend this October course, returning to Canada around Easter of next year, with the next course starting in the spring of '85.

b. PC/DC/VA:

Officers finishing the MEAC will have gone a long way through their conversion from basic engineer to marine systems engineer. When they return to Canada, there will be a bit more classroom time required to cover off some of the MS aspects not addressed in the MEAC: the EO's Power Course, Stability and Damage Control Course, and Advanced Vibration Analysis Course. The latter two are not expected to be changed much, but the Power Course will be modified by Fleet School Halifax to shift the current emphasis on equipment more towards the systems engineering perspective in keeping with our ultimate training objective.

c. NAVAC Operations Course:

Officers will complete the classroom package by attending the Naval Operations course in Halifax. This course, in addition to administrative and Divisional Officer training, will continue to give graduates a PASS standing in four OPDP subjects: General Service Knowledge, Personnel Admin, Military Law, and Financial Admin and Supply. In other words, the content of this course will not change, but the timing has been shifted to a point closer to when officers will use this knowledge in sea and shore jobs.

d. At-Sea Training

The last element of Application Training is the at-sea portion of Phase 6 (summarized in Figure 5). Its purpose is to finalize the merger of academic and practical knowledge in Marine Systems applications through onboard experience.

The OJPRs in this element will not differ substantially from those currently covered in the existing Phase 4 and part of the existing Phase 6 (that's the EWK and A/EO phases), except the emphasis will shift from operator abilities to systems engineering. Under the current training scheme, we have for several years used the device of obtaining the equivalent of Cert 3 to measure the acquisition of systems knowledge. The shortfall in this approach is that the device becomes the objective and too much emphasis is put on operator skills. Reviewing even the old officer employment pattern for the MS sub-classification, we could find no stated requirement for officers in charge of a watch to actually operate the machinery plant; thus we ended up training to a non-existent requirement.

The need for operator certification has been removed from the revised training plan. That is not to say that trainees won't spend time on the "plates". There is no other way to gain a full understanding of systems interactions, safety procedures and overrides, the need to sustain ship mobility, and the vital role of the operator in the ship. In other words, the need for systems understanding is not diminished, but strengthened. However, the need to operate with the proficiency of a Cert 3 has been removed.

Completion of the OJPRs will be followed by an oral examination for sub-classification qualification. The term "oral exam" is used instead of "oral board" to satisfy CF training system requirements that training be terminated by an examination. It's a semantic nuance - trainees will still face that frightening prospect of a critical inquisition.

Officers who successfully navigate the shoals of the oral exam will be awarded their sub-classification qualification, MOC 44B.

PHASE 6 (SEA) – APPLICATION TRAINING

FIGURE 5

PURPOSE	– COMPLETE TRANSFORMATION OF ACADEMIC QUALIFICATIONS TO MARINE SYSTEMS QUALIFICATIONS
PREREQUISITES	– DEGREE OFFICERS – PHASE 6 (SHORE) – CFR OFFICERS – TECHNOLOGIST DIPLOMA – 44A – APPLICABLE PHASE 6 (SHORE)
METHOD	– OJPR AT SEA, TERMINATED BY ORAL EXAM
LOCATION	– TRAINING SQUADRON
DURATION	– 5 MONTHS
COMMENT	– CONSOLIDATION PERIOD ESSENTIAL TO LEARN SYSTEM INTERACTION, SAFETY OVERRIDES, ROLE OF OPERATOR, AT-SEA "SEASONING" – COMPLETES SUB-CLASSIFICATION TRAINING WITH AWARD OF 44B – COMPLETES FIRST DEVELOPMENT PERIOD

TECHNICAL CONTINUUM

FIGURE 6

OFFICERS — { POST-GRADUATE ENGINEER / GRADUATE ENGINEER / TECHNOLOGIST }

{ TECHNOLOGIST / TECHNICIAN / MECHANIC } — OTHER RANKS

This denotes acceptance into the Marine Systems profession, as a "licensed to practice" junior engineer, and completes the First Development Period.

CFR TRAINING PLAN

As you will see from the training plan, the intent is to bring CFRs to the academic standard of a Technologist's Diploma achieved by attending a Community College in Canada. This is a departure from the current practice of sending CFRs to the Special Duties Officers' Course at RNEC Manadon, and is a recognition of the technical continuum (Figure/6) which we see as making up the practice of engineering in the navy. The basic structure for Ordinary Seaman to C1 has been formalized by the MORPS introduction of mechanics, technicians and artificers, and the officer portion is simply a clear statement of how we employ our degree of CFR officers.

An academic package is being identified for the Community College Diploma, and one officer (Commissioned Officer Proulx) will be starting this fall on a pilot project. Others will continue on the SDO Course until this activity is better defined.

A few comments on the SDO Course: RNEC has modified the course within the last few years to bring its academic content in line with the requirements of the U.K. Technician Education Council's Higher Certificate, which is broadly equivalent to first-year university standard. Completion permits the involved CFRs to apply for registration as Technican Engineers. This parallels the approach we are taking with the Community College Diploma, which will permit our CFRs to apply for Technologist status in Canada.

The basic differences (and the reasons for bringing this training home) are that, first, it <u>is</u> in Canada and, second, we wish to shift the emphasis from <u>Operating</u> Technologist to <u>Design</u> Technologist with a proper selection of course patterns.

Notwithstanding this change, we recognize the the CFR officer brings his past practical experience with him and will not need to attend the MEAC. He is thus injected into the training scheme after the RNEC element and, from that point on, all officers undergo common training.

FIRST DEVELOPMENT PERIOD

A few more words about the term "First Development Period": this is a "green machine" term used to identify the time spent producing an officer to Basic Spec level in preparation for his first job. Because it suits us to do so, we have been a little loose in our interpretation and have carried the First Development Period past 44A to the attainment of 44B. Another way of phrasing this is that, although an officer may be employable at 44A he is only marginally so, and we prefer to have him complete sub-classification training before considering employment.

Having completed the First Development Period, officers are removed from the Training List and the PER process is introduced. The Second and subsequent Development Periods are employment periods divided essentially by rank level. Any further training is related to either a specific job requirement or an aspect of professional development.

Now, how does this differ from what we do today? In the first place, we currently have a Basic MS Spec which calls up Chief-of-the-Watch qualifications, but we don't employ our officers (except during training) in such positions; we have no establishment positions for officers as Chief of the Watch. Clearly, under these circumstances, the First Development Period couldn't terminate with qualification to the Basic Spec - there's no job for which meeting the Spec qualifies the trainee.

We must conclude, therefore, that an officer today cannot be considered employable until he meets the requirement of the current Advanced Spec. In other words, we can't give him any job until he qualifies to be EO of a ship. Does this mean his first job should be as EO? Present practice says "no", since we try to insert a shore job before EO employment. In addition, we still show a LCDR rank in the REMARs for most EO positions, and officers won't make LCDR as soon as they finish their training no matter how good they are. We are, today, in an unsupportable position in the eyes of our Personnel System.

The MS Officer Spec is being amended to reflect a more realistic scenario. Since the CF rules dictate that the Spec reflect the knowledge and skill requirements for the first day of the first job, we conducted a task analysis and determined that MS officers must be trained to a systems engineer level before they could be deemed employable. This level is reflected in the revised Officer Spec, and the training plan caters to this new approach. The graduate of the revised MS training plan will be a qualified marine systems engineer who is employable in a broad range of junior engineering positions.

Employment ashore could be in most of the pre-EO jobs we currently fill, and I anticipate that a thorough review of the qualifications called up in the new Spec will result in the identification of other possible positions in TSDs, SRUs, training establishments, NEUs and NDHQ. I suggest this caution to the "employers" and supervisors of these officers: don't feel constrained by the way you are currently organized, because your organization is based on different officer qualifications. Keep an open mind.

AMSEO

First employment is not only in shore positions. In fact, the preferred first job is at sea as Assistant EO (see Figure 7). Our intention is to establish hard billets in all ships for these positions and post 44B qualified officers into them. Where possible, we will try to establish two billets per ship but, because we wish to expose as many officers as possible to this employment, the posting duration may be limited to one year.

Terms of Reference for the A/EO job have been defined and include the four major task areas of Personnel, Machinery Operation, Machinery Upkeep, and Damage Control. We envisage that, apart from a brief ship-type familiarization, Application Training will have provided the knowledge necessary for each officer to perform the A/EO tasks.

How can this officer assist the EO? In the Personnel area, he will be Divisional Officer for Master Seamen and below, and can ensure the training program and PER preparations are properly organized. On the Operations side, he can perform machinery rounds and coordinate rounds

AMSEO POSTING
FIGURE 7

PURPOSE	– PROVIDE VIABLE AT-SEA EMPLOYMENT FOR JUNIOR MS OFFICERS – PROVIDE OPPORTUNITY TO UNDERSTUDY EO
PREREQUISITE	– 44B
METHOD	– POSTING TO HARD BILLET
LOCATION	– HMC SHIPS AND SUBMARINES, BOTH COASTS
DURATION	– 12 MONTHS
COMMENT	– NOT A TRAINING BILLET – EMPLOYMENT COVERS – PERSONNEL – OPERATION – UPKEEP – DAMAGE CONTROL – UNDERSTUDYING EO LEADS TO BOARD FOR HEAD OF DEPARTMENT SPECIALITY QUALIFICATION

reports, and coordinate the Departmental participation in periodic trials. In Maintenance areas, he can monitor and schedule workload in maintenance periods, coordinate Departmental requirements, and prepare reports and returns. And in the Damage Control task area, he will coordinate the shipboard damage control training program, monitor the DC equipment maintenance efforts, and participate in DC exercises. This is just a sampling of A/EO tasks. To flesh it out, just ask yourself what you, as EO, would like to have help with.

Now, the most pressing question at this point is probably "What is the interaction with the Chief ERA?" I think the answer is best given in terms of line and staff organizations. The Chief ERA is part of the line organization and stands in for the EO in his absence. He is the Deputy EO. The Assistant EO is just that - an assistant - and is thus part of the staff organization. He cannot stand in for an absent EO unless or until he qualifies to be a Department Head - and that brings me to the second purpose for putting 44B qualified officers into ships: to understudy the EO.

The job of EO is one of the most important individual jobs an MS officer can do, and it is the only one we have identified where simply a turnover of a week or two won't suffice. During his posting as A/EO the junior MS will have at least a year to understudy the EO role. A series of OJPRs has been devised, to be completed during the A/EO posting, which will ensure all aspects of the EO's job are studied. We expect all A/EOs to complete these OJPRs during their posting period aboard, and to formally qualify to be Department Head by sitting a board. Successful completion will result in the award of a Classification Specialty Qualification (CSQ) equivalent to our current Certificate of Competency Part II.

To my knowledge, this is the only sub-classification CSQ which we will award MS officers through the mechanism of a formal board, and it reflects the importance attached to the EO position. If you wish to draw a parallel, you might say this is equivalent to the MARS CCO qualification.

CONCLUSION

This article has explained the rationale for many of the proposed changes, and outlined the training plan through which we intend to achieve the overall aims of professional competence and early employability of MS officers.

In addition, it has provided a bit of an insight into part of the post-qualification employment pattern. You will hear more later about career patterns and professional development, but I'll give you a little preview now. Most of you know about the courses at Staff School and Staff College, and no changes are proposed to their nature or timing. To add to the ability of all MAREs to function ashore, we propose to develop two more courses: an Administration Course to be taken early in the first shore job, and a Project Engineering/Project Management Course to be taken by senior lieutenants and junior LCDRs.

Since my purpose in this article is mainly to elaborate on sub-classification training, I won't go into any detail on these course packages. As I said, you willd hea more later on these and other aspects of the Second and later Development Periods.

This revised structure and training plan results from years of study, introspection and analysis; it can be covered only superficially in a brief article. I would like to leave you with these overall conclusions. The revised MARE/MS Training and Development concept:

a. retains the professional competence of the MS officer;

b. provides earlier employability;

c. retains the importance of the EO position; and

d. recognizes both sea and shore employment requirements.

MARITIME ENGINEERING MARE CLASSIFICATION

GET WELL PROJECT

BY CAPTAIN(N) W.J. BROUGHTON, CD, CF

THE NEED FOR A GET WELL PROJECT

Many Maritime Engineers will have been exposed to extensive and detailed briefings on the MARE Get Well Project at the Professional Development Seminars '84 held in Esquimalt, Ottawa and Halifax. Prior to these events, all of the major aspects of the MARE Get Well Project were the subject of much consideration and debate. My purpose in preparing this article is to reach a wider naval audience with a consolidated treatment of the Project.

Perhaps the best place to start is to note the origin of the Project title, one that has not escaped criticism for its implied infirmity of the classification. Although the term "Get Well Project" was inherited from the actions within the NDHQ Personnel Group to correct general problems among all of the CF engineering classifications, the need to "get well" was particularly acute for the MARE classification and its members.

Let's face it. As we entered the eighties the MARE picture could be described, at best, as unattractive. The need for more MARE officers to meet project management requirements for the ship replacement program had been forecast for several years. Despite this, there had been no success in improving a chronic shortage of MARE officers. Then attrition climbed sharply meaning even more to be done by fewer officers. MARE posting vacancies grew to over 100. At that time the planned delivery date of the Canadian Patrol Frigate had been delayed and it was still sliding with no clear end in sight as governments changed. MARE graduates who had learned solid state technology at universities and colleges had to be taught vacuum tubes by the navy so that they could operate and maintain the aging fleet. With situations like these, it was not taking long for even our young Maritime Engineers to realize that the classification had problems. The very role and status of the classification was being openly questioned by all ranks. In short, the prevalent feeling was that of a vicious circle, and one that was starting to spiral earthward.

With all of these alarm bells ringing, Maritime Command, ADM(Per) staff and the Branch Adviser (the Director General Maritime Engineering and Maintenance in NDHQ) began a variety of concerted activities to turn around this deteriorating situation. As the problems were studied it became more and more apparent that they were numerous and complex. At the suggestion of Commodore Ross, through the Commander Maritime Command to ADM(Per), a full time project officer was assigned. It has been my privilege and pleasure to act as a focal point for the Project, to pull a few strings and, hopefully, to help set us on a road to recovery. However, I humbly hasten to add that the ideas, the contributions and the plain hard work done by others in support of "getting well" are really what have provided some very significant improvements. In many cases this support has come from concerned naval officers, but equally it has come from many others by virtue of their appointed responsibilities.

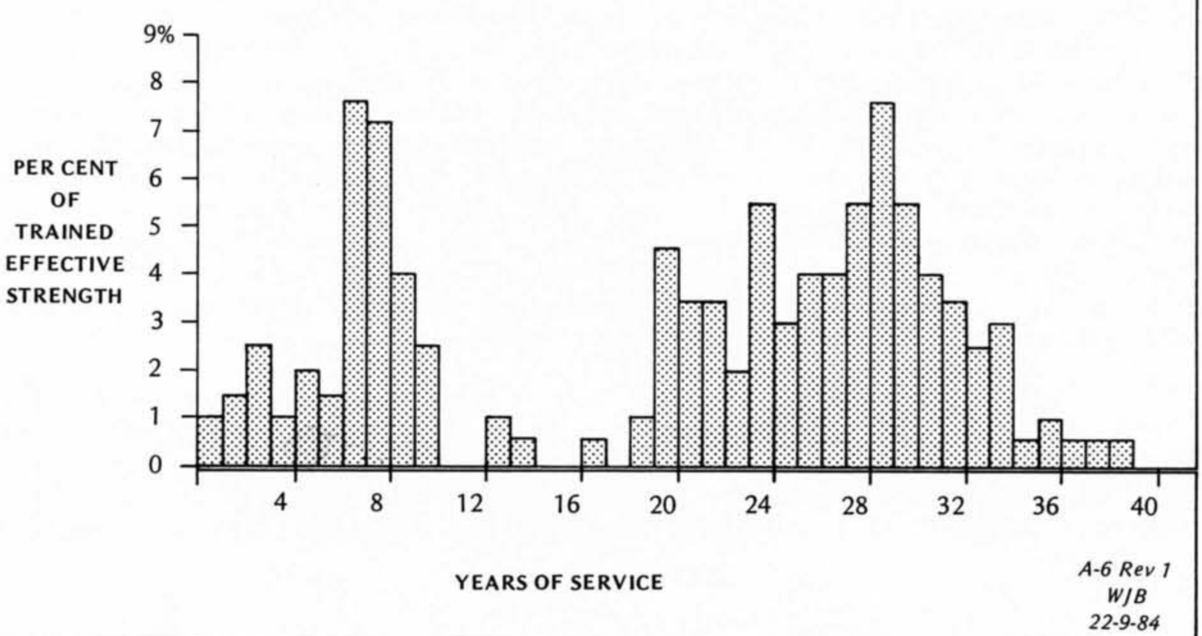
ATTRITION

The subject of a attrition could be a lengthy article in itself. I will restrict my comments here to who, why and how much attrition for trained MARE officers. Figure one gives the distribution of attrition over the five-year period, 1978/79 to 1982/83, in terms of percent of trained strength plotted against years of service. The prime categories for releases are seen to be young lieutenants who leave on completion of their obligatory service or first engagement, and the older group of lieutenant commanders and above who leave without pension penalty after 28 to 30 years of service or more, but before compulsory retirement age (CRA). There is a smaller bump at the OCDP 20/40 point. The latter will remain a minor factor throughout the eighties, if not longer, simply because not many officers will pass through this change-of-engagement point.

Why do MAREs leave? Among the older group it invariably is a combination of several factors. In effect, after some thirty years of

MARE TRAINED ATTRITION FOR FY 78/79 THROUGH FY 82/83

Figure 1



service these officers have sufficiently completed a career in the navy to make a personal decision as to when they wish to start a second career and/or retire. The availability of a job "on the outside" and job satisfaction "on the inside" are circumstances that simply are not controllable in a general way in the context of a Get Well project.

However, the large loss of junior officers had to be stemmed. A close review was made of the various reasons given by them as to why they had decided to leave. Of all the factors, two were prominent over which we have direct control - "lengthy training", and "too long to get into the first real job". Accordingly, training times have been reduced, and a major change has been made in job status while working towards the ship department head qualification for Marine Systems (MS) and Combat Systems (CS) officers. I will return to training later.

Lastly on attrition, there are a number of myths surrounding the severity of the problem. I do not mean to imply that attrition is not important, but one should examine numerical facts in comparative terms. Only then can there be a proper perspective and appreciation. Here are two examples of "myths":

(1) "We lose an inordinate number of candidates at the Chilliwack Basic Officer Training Course. If we ran it in the navy way, things would be different". Maybe. The CF average success rate at BOTC for the last three years for ROTP was 90%, and it was 89% for MAREs. The CF average for DEOs was 78% and 72% for MAREs. BOTC training may be important to examine but not on the grounds of unusually higher MARE release rates.

(2) "MARE attrition has been so bad for so long that the only way to get well is to reduce it substantially". Of course, fewer releases would mean more on strength to meet the requirement . But the classification is subject, if you will, to the Second Law of Thermodynamics. Some level of inefficiency (releases) is unavoidable! But how much?

Well, let us suppose that the MARE release rate had been the same as the overall CF officer release rate for each of the last ten years. The result shows that the classification would then be short 94 trained officers instead of 138. Clearly there would <u>still</u> be a BIG problem. So, although the prospects of new ships, technological challenge, improved training and whatever else we expect will help to reduce attrition all have importance, the biggest numbers problem is not high attrition, but low production. The only way we could be close to full strength today, or that we can get up to strength in the future, is through significantly increased production.

RECRUITING AND PRODUCTION

The first step to increased production is, of course, success by our recruiters. The recent economic situation has been a boon in this respect. Unlike previous occasions when the system was not quite attuned to our needs and failed to capitalize fully on an easier recruiting climate, last year was an unqualified success. The total MARE recruiting quota for all entry plans was approximately doubled in 1983/84 to 172, and 168 Maritime Engineers were enrolled. They will produce about 100 qualified MARE officers in due course spread over several years depending on entry plan (ROTP, DEO, CFR, etc.). This year's quotas are similar and the recruiters are striving for equal success. Already (June) a total of 92 offers have been made to suitable ROTP applicants to fill a quota of 75. In that our formal replacement rate when at full strength will be on the order of 50 per year, you can see that a great start has been made. And yes, we will be able to train them all because of the high priority that the Commander Maritime Command has placed on training and the long hours of detailed re-scheduling and bunk-counting devoted by Commander Davie as SSO Training in conjunction with Training Group Pacific.

I should note here an earlier recruiting change that has had a dramatic and positive effect on ROTP and DEO recruiting. Young applicants are more likely to know that they wish to take engineering than what CF officer's classification interests them most. (I say this despite the recruiters telling me that Canadian youths wish to be either pilots or brain surgeons. Maybe Cdr Marc Garneau's space exploits will spill over some would-be pilots into Maritime Engineers.) Prior to 1981, MARE and MARS officers were recruited together as Naval Ops and then split later in their training. As a result, those who wanted to be engineers did not realize that Naval Ops could mean engineering employment. As Branch Adviser, Cmdre Ross pursuaded the Navy and the recruiters that, although MAREs belong to the Naval Operations Branch, they should be recruited as engineers. He obtained the best possible result with the MARE classification as a separate, stand-alone entity for purposes of recruiting. The results show the wisdom of this change. We used to get only a handful each of ROTP and DEO candidates. Last year and this we will enrol around 150 total, and nearly all of the large increase in offers has gone to those who have given MARE as their first or second choice.

ROLE AND STRUCTURE

When faced with a shortage of up to 30%, the quantity of officers is inescapably important as I have emphasized above. But we are dealing with people and organizations. Accordingly, equal attention has been paid to quality in respect of the MARE role and employment and how these requirements are to be met in terms of structure and qualifications.

Under the auspices of the Branch Adviser, Cmdre Ball, a wide-ranging review of the professional development of Maritime Engineers was conducted from 1981 to 1983. It included a task analysis of typical MARE jobs and an examination of the current MARE structure, training, development and employment patterns. The review paid particular attention as to how well the existing policies and practices were in tune with the CF personnel system and it took pains to make recommendations that would not be contrary to that system.

A number of key principles flowed from the resulting "MARE Study 83". Some were confirmatory while others were evolutionary. First I will summarize the confirmatory principles; that is, those that represent no basic change.

(1) The MARE employment roles are operations and maintenance, design and acquisition, the training of personnel, and the building and sustaining of the military and industrial infrastructure. These roles are interdependent in support of naval missions and the fleet. The education, training and qualifications of Maritime Engineers must therefore support these roles, particularly the first two (main) roles.

(2) Because of the wide employability of MARE officers within the CF, they are and should remain on the Officers General List and not the Specialist List. On the one hand this means increased (broader) opportunity for senior rank. On the other it means no specialist's pay.

(3) Maritime Engineers belong to the Naval Operations Branch which, among other things, means a basic common sea qualification. This has been determined to be Officer of the Day in harbour (alongside) and it is now a requirement for all MARE officers regardless of entry plan.

(4) Lastly, the nature of the engineering contribution which MAREs bring to the naval operations team is primarily a systems perspective and a design competence. That is to say, we should not be training Maritime Engineers largely in the technician's job of the other ranks. In the past we have tended to do that. This weakness in our training is being corrected with some saving in sea training time.

Certain <u>changes</u> in concepts were recommended by the MARE Study-83. These were presented to, and agreed in principle in turn by, the MARE Council, the Steering Group of the Naval Personnel Planning Project (NPPP), the Commander Maritime Command and the Military Personnel Planning Board (MPPB) chaired by ADM(PER).

(1) There are three occupational groupings involved in naval engineering as evidenced by the organizations of DGMEM and the NEUs. These are marine systems engineering, combat systems

engineering and ships systems engineering. This fact could be used as an argument to create three separate classifications. However, it was agreed we should remain one because there would be no difference in the resulting training or career management, and the maritime engineering community had expressed clearly its preference to remain one classification. The initial recommendation on subclassifications was that there should be three: marine, combat and ships systems engineering. However, a closer examination of the employment of these groups revealed that, within ships systems engineering, Naval Constructors (NC) and Naval Architects (NA) do different, though complementary jobs. For example, of over 40 NC and NA positions, only three are coded "either NC or NA". The rest are either one or the other. This employment pattern, and the resulting clear difference in training, necessitated separating them into two corresponding subclassifications. Although, there may be an appearance of separating CFRs from degree officers simply because they are CFRs, that is really not the case as I have indicated. For example, there can be both NC and NA DEOs. Employment patterns is also why there is no similar split for MS or CS officers. In their cases, officers are largely interchangeable within their respective subclassifications regardless of entry plan once they have their ship's Department Head qualification. The four-subclassification structure (MS, CS, NC and NA) has now been approved.

(2) A second change is adoption of the principle that the minimum education level normally will be that of the engineering technologist diploma. The main implication is to make provision for CFRs to so qualify. In this respect, NCs have been attending the Fisheries College at St. John's, Nfld. for several years now and CSs started at St. Lawrence College, Kingston, Ont. two years ago. This year the first MS CFR will follow this route and attend the Fisheries College. In each case, they take courses in their own field of naval architectural, electrical/electronic or marine technology. This program particularly suits the younger CFR candidate. There is also provision for senior men to continue to be commissioned and be employed as officers utilizing their trade specialty knowledge and experience without undertaking the technologist program.

(3) The last is a change in the structure of the MS and CS qualifications noted earlier. Currently these officers achieve their ship's Department Head qualification (the so-called Certificate of Competency Part II or CC II) as part of their subclassification qualification. One of the shortcomings of this arrangement is the resultant very long training period before employment in the first job. On examination it was noted that when these officers obtain the essential sea experience and

maturity to earn their CCII, they actually are performing divisional officer and assistant engineering duties. Accordingly, rather than posting them to ships on the Advance Training List (ATL), they now will be posted after successful completion of their applications training as Assistant Marine and Combat Systems engineers, i.e., in their first job. Although it is possible to take a different first job ashore, MS and CS officers normally will be expected to complete their CCII. In order to make this change, approval has been given in principle to convert the requisite number of ATL credits to hard MARE positions as assistant engineers in ships. Forty-five to fifty positions are involved. I should note that this change will not affect the numerical requirements of the MARE classification because ATL credits also are included in a classification's Preferred Manning Level (PML).

I want to assure the naval community at large that a great deal of deliberation and soul-searching by many, many people went into the last-noted change. One of the factors that had to be taken into account was the fact that when the MARE classification is up to strength, it will not be possible with the increased strength for all MS and CS officers to serve a tour as a ship's Department Head. There were really only two options. One was the arrangement that was adopted. In essence it means that the acceptable level of common professional development for MS and CS officers is to qualify to be posted as Head of Department and not necessarily to have been a ship's Head of Department. In effect, ships's Head of Department was recognized as only one of a number of demanding jobs of similar stature as a lieutenant commander or senior lieutenant(N). The other option was to adopt a structure based on a wet and dry list. The biggest problems with wet and dry lists are the brooding over which list would be of higher stature (or neither), and what written and/or unwritten rules concerning potential and advancement would prevail. In short it was seen as a divisive and unnecessary move. (Author's Note: I did not act as a spearhead for this decision. It was made by the MARE Council with many others having been involved in the discussions. However, having said that, I did and do support it wholeheartedly. I would go even further and say that the development of even the slightest degree of ingrown elitism by MARE officers around having been a ship's Department Head would be, in my opinion, very unfortunate and unnecessary indeed.

TRAINING

The MARE Study-83 concerned itself with MARE professional development. However, the MARE Get Well project has concentrated on initial training during the First Development Period and the ship Department Head qualification in the Second Development Period. A number of the important aspects have been raised already. There are a number of other changes I will now highlight .

MARE CLASSIFICATION TRAINING
("COMMON")

Figure 2

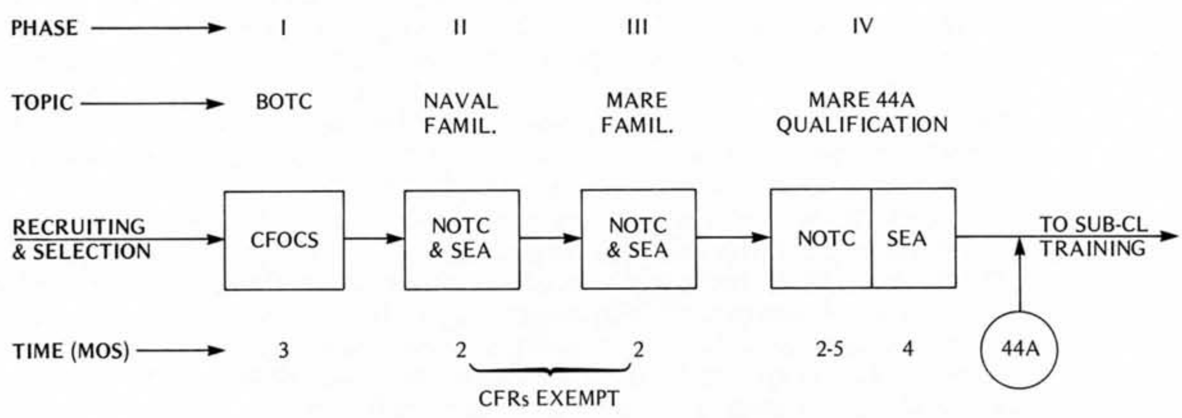


Figure 2 shows the four phases of common classification training leading to the basic MARE qualification 44A. There are no changes to the current Phases 1 and 2 as a result of the MARE Get Well Project. There will be some changes to Phase 3. The three weeks' instruction ashore and five at sea now will have one week and two weeks, respectively, common to all MARE officers taking the training. The remaining Phase 3 time will have similar training for all, but will be geared to the particular subclassification. The first large changes occur in Phase 4. Commencing in the fall of 1984 there will be three elements in Phase 4.

(1) There will be a new, three-week MARE Basic Course to meet basic technical skills and knowledge requirements concerning the practices and procedures used by MARE officers.

(2) The four-week MARS/MARE IV Common course remains unchanged.

(3) The Phase 4 Sea is "standardized" to four months duration for all subclassifications. Officers are to complete the qualification of Officer of the Day (OOD) in harbour (alongside) and specified On-the-Job-Training Standards (OJTSs) related primarily to the individual's subclassification.

This Phase 4 Sea represents no basic change for CS officers from their revised training that was made effective over the last two years. On the other hand it is a major change from the current 12 months for MS officers to gain the engineering watchkeeping ticket. They do not lose eight months in sea experience, however, as five months of sea applications have been inserted after the subsequent Royal Naval Engineering College (RNEC) course to better consolidate that training. There will be changes also for NCs and NAs as they will have their own subclassification OJPRs in

Phase 4. In the case of the NCs, they normally will be posted to an AOR for Phase 4 Sea under the Liquid Cargo Officer.

At one point in the development of the revised training, it was thought that Phase 4 should be reduced and devoted solely to imparting the skills and knowledge common to all subclassifications as called up on the MARE basic specification, i.e., with no subclassification training. But when one examines the sea phase, about four months must be allowed to complete OOD training because of the queuing problem with many trainees aboard each ship. The best use of the "delay time" can be made by advancing some of the subclassification sea training requirements into Phase 4 Sea; and this has been done.

Before I proceed to the subclassification training, I draw the reader's attention to Figure 3. It shows the CFR training plan up to the 44A qualification as mentioned earlier. This plan represents a year's less time for NCs from their current program. Subclassification training is shown in Figure 4.

(1) Marine Systems (MS) (44B). The Marine Systems Applications Course at RNEC has been reduced from nine months to 27 weeks by tailoring it better to MS needs and making arrangements for all-Canadian courses. MS CFR officers will bypass this course if they were a Cert 3 before commissioning. As noted earlier, RNEC is followed by five months' sea time in the training squadron to complete the new subclassification training and award of the MS qualification. During this period MS officers will continue to take several short courses including the Divisional Officer's Course, the Engineering Officer's Power Course (EOPC), Stability and Damage Control and an advanced Vibration Analysis Course.

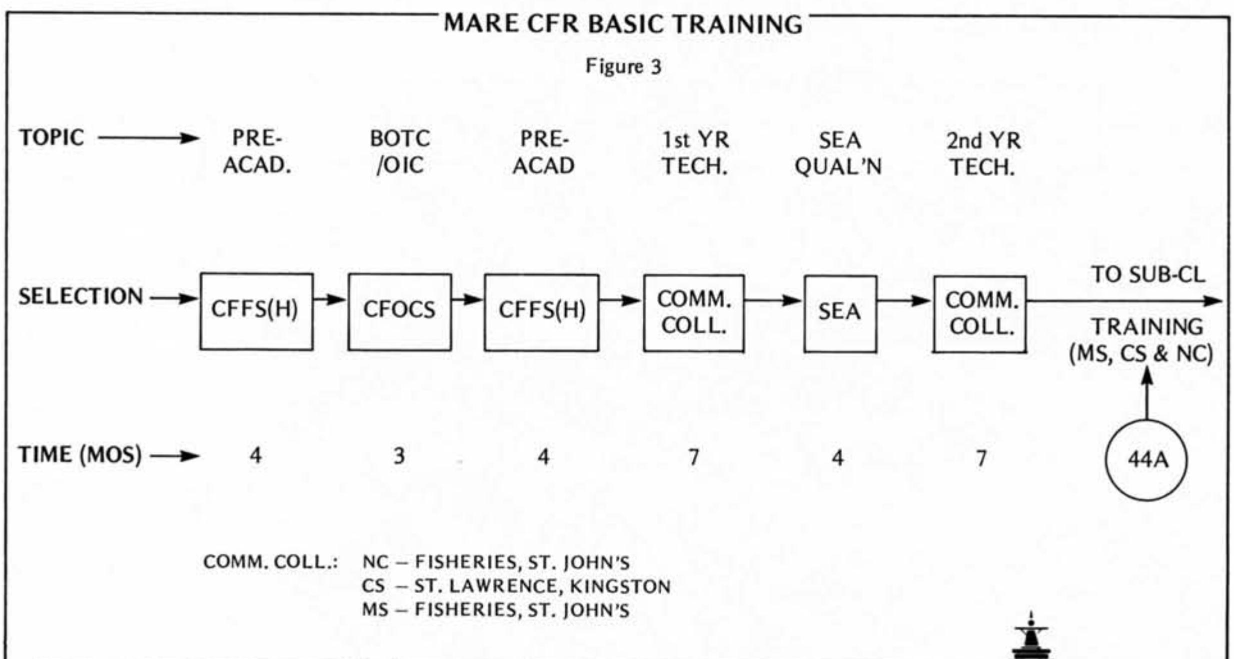
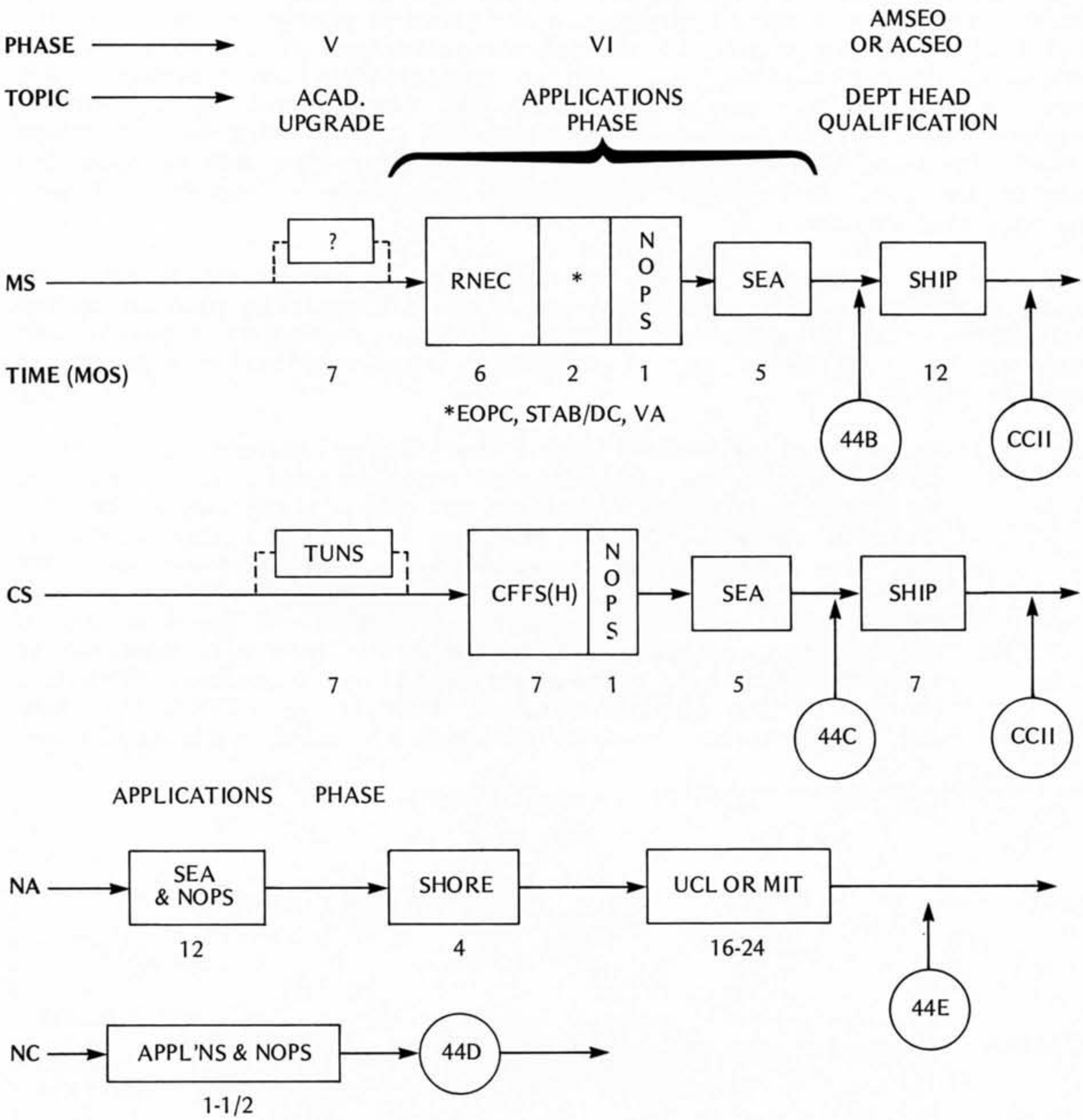


Figure 3

MARE SUB-CLASSIFICATION TRAINING

Figure 4



The length of the subsequent posting as the Assistant Marine Systems Engineering Officer (A/MSEO) in an operational ship has not been determined as yet given the changes in prior MS training. It is shown at 12 months, although a 7-month option is also under consideration. No further work is underway for the present on the possible Phase 5 Academic Upgrading module for non-engineering degree officers. As such, a course currently exists for CS officers and recruiters are able to fill MS quotas with mechanical engineers. At least for the near future, non-engineering degree officers will be directed towards CS engineering, or possibly Naval Architecture.

(2) Combat Systems (CS) (44E). The Combat Systems Applications Course continues to be seven months at the Fleet School in Halifax. The current 12-month sea posting in an operational ship will be retained, but the training is split into two. There will be a five-month package to complete subclassification training and award the CS qualification. The subsequent seven months will be as the A/CSEO working towards the CS ship's Department Head qualification with the qualification to be verified by a board similar to the long-standing MS CCII Board. During this time CSs also take the Divisional Officer's Course. Those who do not have a solid background in electrical engineering subjects make these up in a prior Phase 5 academic module coordinated with the Technical University of Nova Scotia (TUNS).

(3) Naval Construction (NC) (44D). The heart of the NC training is in fact the two full terms at the Fisheries College. After graduation and completion of the MARE Basic Course, it is currently planned that they will have a six-week shore Applications Course and the Divisional Officer's Course before being granted their subclassification qualification and posted (normally) as the Liquid Cargo Officer on an AOR.

(4) Naval Architecture (NA) (44E). NAs will no longer be required to first qualify as an MS, CS or MARS officer. These officers will follow their own training plan. Following their Phase 4 Sea they will be posted to an operational ship for a twelve-month Sea Applications Phase at which time they will also take the Divisional Officer's Course. This sea time will be spent under the guidance of both the ship's XO and the Naval Architecture Officer in the Naval Engineering Unit. Experience will be gained in all ship's departments and NAs will be boarded to validate satisfactory completion. There will follow a four-month NA familiarization period with time at NDHQ, an NEU and a Technical Services Detachment before proceeding to the Massachusetts Institute of Technology (MIT) or the University College London (UCL) as a post-graduate student in naval architecture. It will

be necessary, of course, to pre-select these officers and obtain provisional entrance acceptance by MIT or UCL, preferably before they commence Phase 4 Sea.

CONCLUDING REMARKS

As you see, a redesign of the structure and training of the MARE classification is underway. I believe that the changes represent sound, evolutionary improvements. However, they will be for nought if we do not increase production. And there we have been blessed with a significant boost at getting well. Even so, there is a long way to go as recruiting is expected to become more difficult once again as the recession eases.

I have given you a brief glimpse of most of the features of the MARE Get Well Project. There have been others such as special enrolments, MARE Reserves, and the preparation of both a MARE Role Statement and a MARE Development Guide. All of these actions are intended to generate a positive spirit by visible result with maximum participation. I wish to emphasize and acknowledge again the tremendous amount of support and teamwork that has been given to this Project by so many, many people.

AN OVERVIEW OF

MISSILE GUIDANCE SYSTEMS

AUTHOR LIEUTENANT (N) R. A. MARCHAND

Lieutenant Marchand joined the CAF in 1973 as an ROTP cadet, and graduated from the University of Saskatchewan at Saskatoon in 1977. He served 15 months as A/CSE in GATINEAU and served for two years as Engineering/Administration Officer at CFMETR, Nanoose Bay. Having just obtained an MSC at the Royal Military College of Science, Schrivenham, England, Lt(N) Marchand is now filling a staff position as DMCS 2-2-2 in NDHQ.

ABSTRACT

The Falklands conflict established the importance of guided weapon systems in ship survival. With guided weapon systems being fitted in the CPF and Tribals there is a requirement for all CSEs to have a general knowledge of the weapons and their guidance systems.

The aim of this paper is to review the guidance systems involved in the numerous weapon systems employed throughout the world, and to familiarize the reader with the current jargon associated with them. The advantages and disadvantages of each guidance classification are also discussed for completeness.

INTRODUCTION

The guidance equipment of a guided weapon (GW) system is designed to gather appropriate data which enables steering information to be generated and utilized by the system's control equipment. The modern- day trend is for systems to be integrated into a single digital-based system which provides the required data processing for both guidance and control.

SYSTEM CLASSIFICATION

The guidance systems employed to date may involve several different forms of equipment implementation within the ship-based system and the missile itself, but four basic types of guidance (or hybrids thereof) go towards making up the guidance systems utilized in today's military systems. They include:

a. Command guidance;

b. Beam-riding guidance;

c. Homing guidance; and

d. Navigational guidance.

COMMAND GUIDANCE SYSTEMS

The design aspect that makes command guidance different from other forms of guidance is that the error between the actual and desired missile path is determined by means external to the missile itself. Correction signals are then sent to the missile by a command link, (such as radio, radar, infra-red, laser, etc.) to bring it onto line. Thus a command guidance system must contain four essential elements (Figure 1):

a. Target tracker;

b. Missile tracker;

c. Computer; and

d. Command link.

In a given system, missile and target may be tracked by similar or different equipments utilizing optical, infra-red, radar or T.V. devices. The computer can be comprised of the operator or a digital/ analogue computer or even a combination of the two.

Command systems in themselves can be sub-classified according to the trajectory flown by the missile; the most common command systems are:

a. Command to Line of Sight (CLOS); and

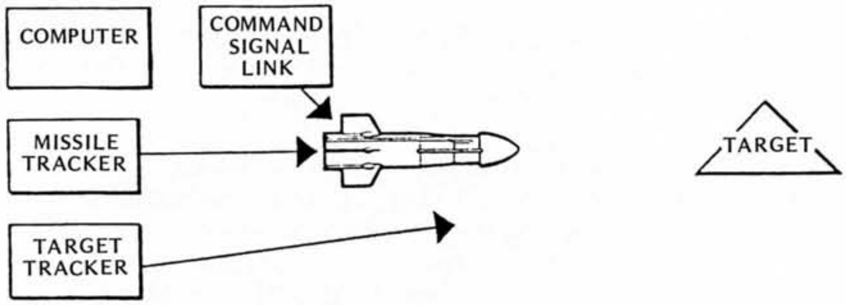
b. Command Off the Line of Sight (COLOS).

CLOS SYSTEMS

In a CLOS system the missile is steered onto the line joining the target tracker and the target. Systems of this nature can be manual, (MCLOS, Figure 1) semi-automatic (SACLOS, Figure 2) or totally automatic (ACLOS, Figure 2) with an increased cost and complexity associated which each increase in automation.

The advantages of a CLOS system stem from the simplicity of the missile and its inexpensive onboard guidance equipment. Missiles of this

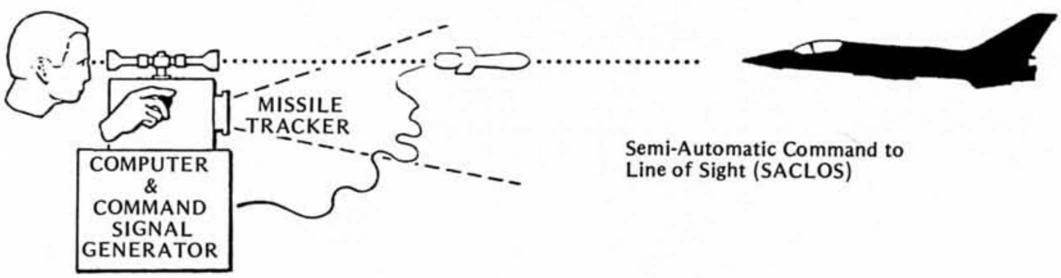
Fig. 1 Command guidance elements and MCLOS



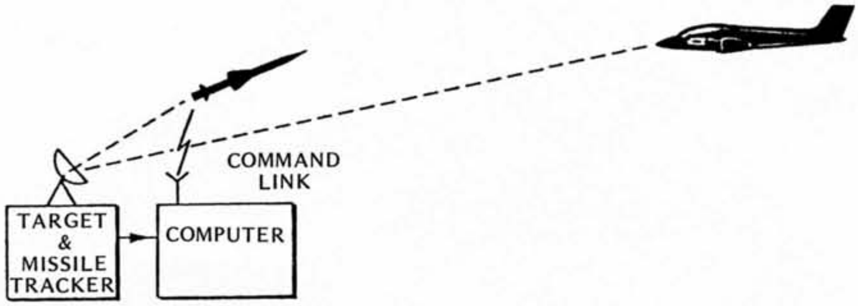
Command Guidance Elements

Manual Command to Line of Sight (MCLOS)

Fig. 2 SACLOS AND ACLOS



Semi-Automatic Command to Line of Sight (SACLOS)



Automatic Command to Line of Sight (ACLOS) type have the nose cone available for the warhead, and there is also good resistance to ECM because the guidance antennas are facing aft towards the shipboard equipment.

CLOS systems, however, suffer from a number of disadvantages: the line of sight to the missile and target must be maintained; multiple fire channels are required for multiple engagements; fast-moving targets can cause large lateral accelerations of missiles (see Figure 3) causing mechanical failure or loss of command signal to missile control antennas; and finally, motor efflux can cause problems with the guidance aspects of this type of system.

The SeaWolf and SeaCat missile systems are members of the SACLOS missile system set and have the same advantages and disadvantages associated with them.

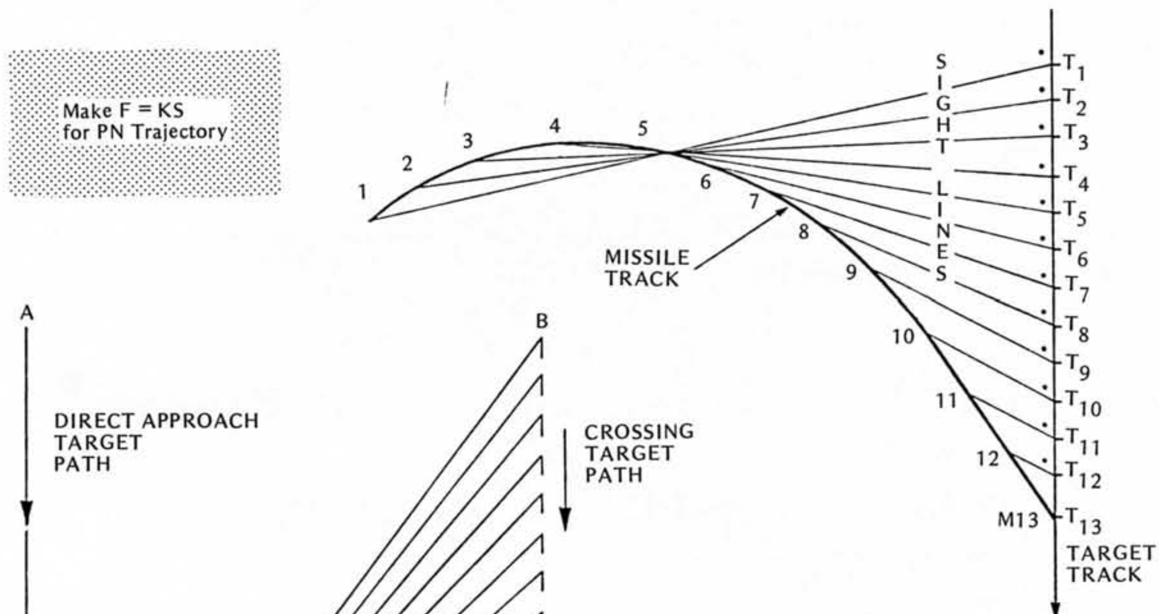


Fig. 4 Homing kinematics

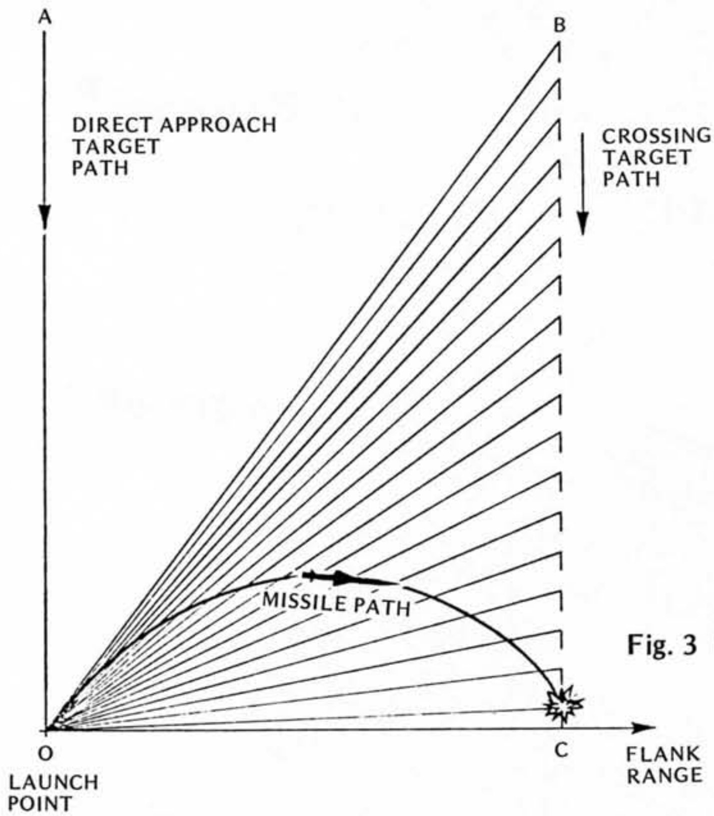


Fig. 3 Line of sight (LOS) path

COLOS SYSTEMS

In the COLOS System shown in Figure 5, the missile is not confined to the line of sight and thus an interception trajectory can be pre-calculated and transmitted to the missile. This allows a smaller acceleration to be "pulled" by the missile especially at the critical impact or terminal stage and also gives the system a greater flexibility over the CLOS systems. It is interesting to note that most Soviet command systems often employ this type of command guidance.

A COLOS system computer is needed to calculate a 3-dimensional solution, requiring target and missile range. COLOS systems therefore must employ complex ECCM equipment in order to overcome jamming which attempts to deny range information, or they must incorporate a second guidance system to overcome the countermeasures employed.

Another important design feature that makes a command missile different from other types is that some form of missile beacon is employed to make the missile clearly visible against the background. These beacons can take various forms depending on the missile tracker equipment and can range from something as simple as a flare for optical systems to IR sources, or microwave reflectors or sources for more complex systems.

The popularity of command systems is more evident in NATO land-based anti-tank systems than in naval systems per se.

Fig. 5 COLOS

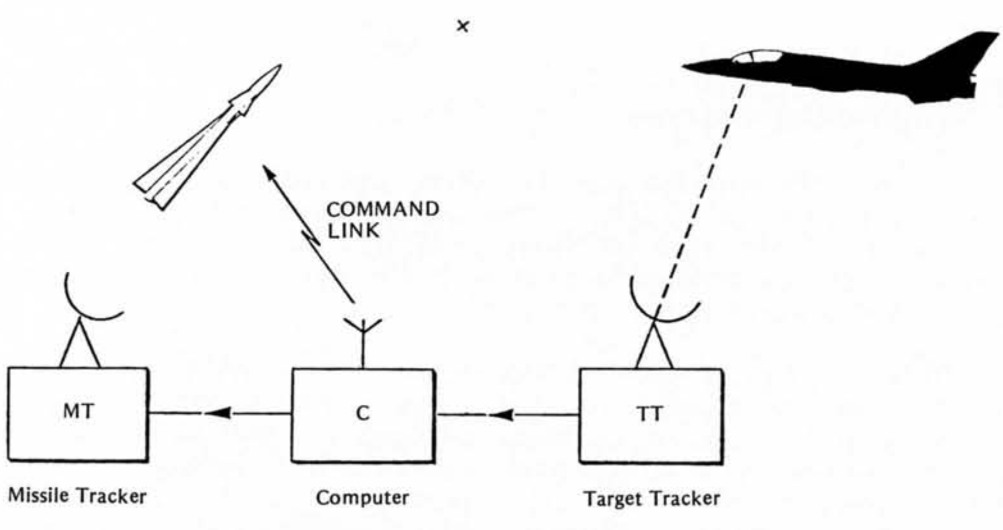
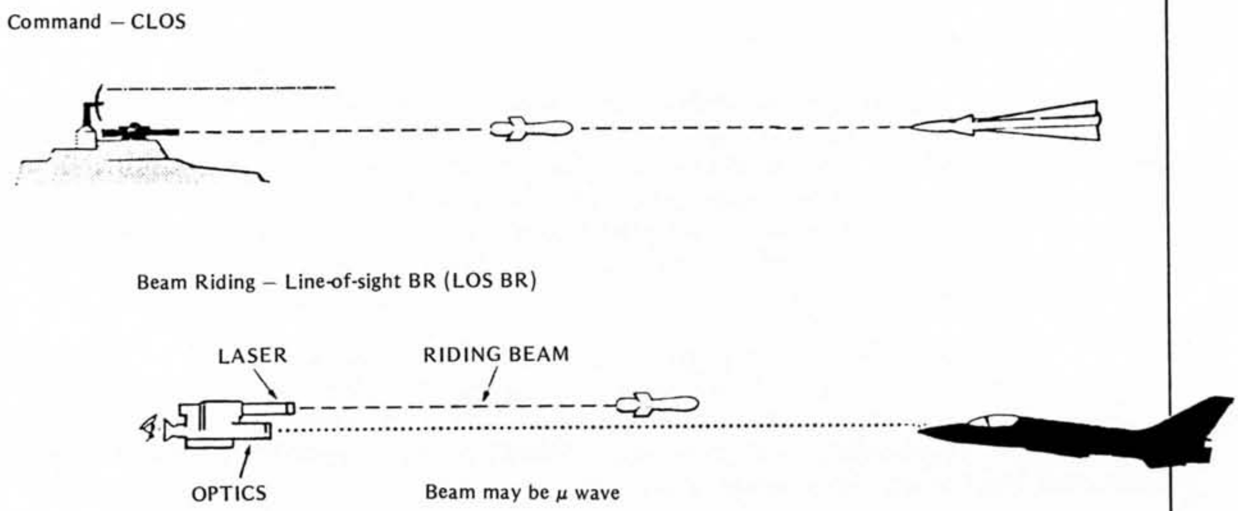


Fig. 6 CLOS and BR



BEAM-RIDING GUIDANCE SYSTEMS

A beam-riding system differs from a command system in that the flight path of the missile is determined by the built-in guidance equipment which constrains the missile to fly along the beam axis, as illustrated in Figure 6. A beam-riding system, therefore, must contain four essential elements:

a. target tracker;

b. beam producer;

c. beam receiver in the missile; and

d. guidance computer in the missile.

Although the missile must fly along the beam axis, any trajectory may be chosen for missile flight. The least complex trajectory is that of beam-riding along the line of sight from the beam producer to the target. Nonetheless, similar considerations with regards to trajectory must be made as for command system trajectories.

The advantages of beam-riding systems are similar to those of command systems in that the missile is less complex than a homing missile and its nose cone is still free of guidance equipment. The beam-riding equipment looks back towards the beam producer thus making it highly resistant to ECCM measures. Beam-riding systems also permit salvo firings to be conducted against a single target. Finally, the line-of-sight beam-riding missile does not require accurate range information since contact or close proximity with the target is all that is required to detonate the warhead.

As with command systems, beam-riding systems suffer from the disadvantages of multiple engagements requiring duplication of equipment, and the equipment being engaged from launch to impact. Beam jitter can be a major problem contributing to error, and the fact that a beam is emitted warns the target of the impending launch of a weapon. Again, a majority of these systems tend to be land based.

Of the naval weapons systems employing beam-riding techniques a majority are employed in the surface-to-air point-defence role. Some of these systems are:

a. Crotale; and

b. ADATS (land-based system with possible naval applications).

HOMING GUIDANGE SYSTEM

A homing guidance system is one in which the missile utilizes autonomous, built-in, guidance equipment which reacts to some form of radiant characteristic of the target. A homing system is characterized by the following elements:

a. A receiver (but not necessarily a transmitter) of the radiant characteristic within the missile; and

b. an onboard guidance computer.

Although not always required, a majority of homing systems employ some form of transmission scheme in the electromagnetic frequency domain. This can be provided externally or internally with respect to the missile.

This, then, leads to three sub-classifications of homing guidance; namely:

a. passive homing;

b. semi-active homing; and

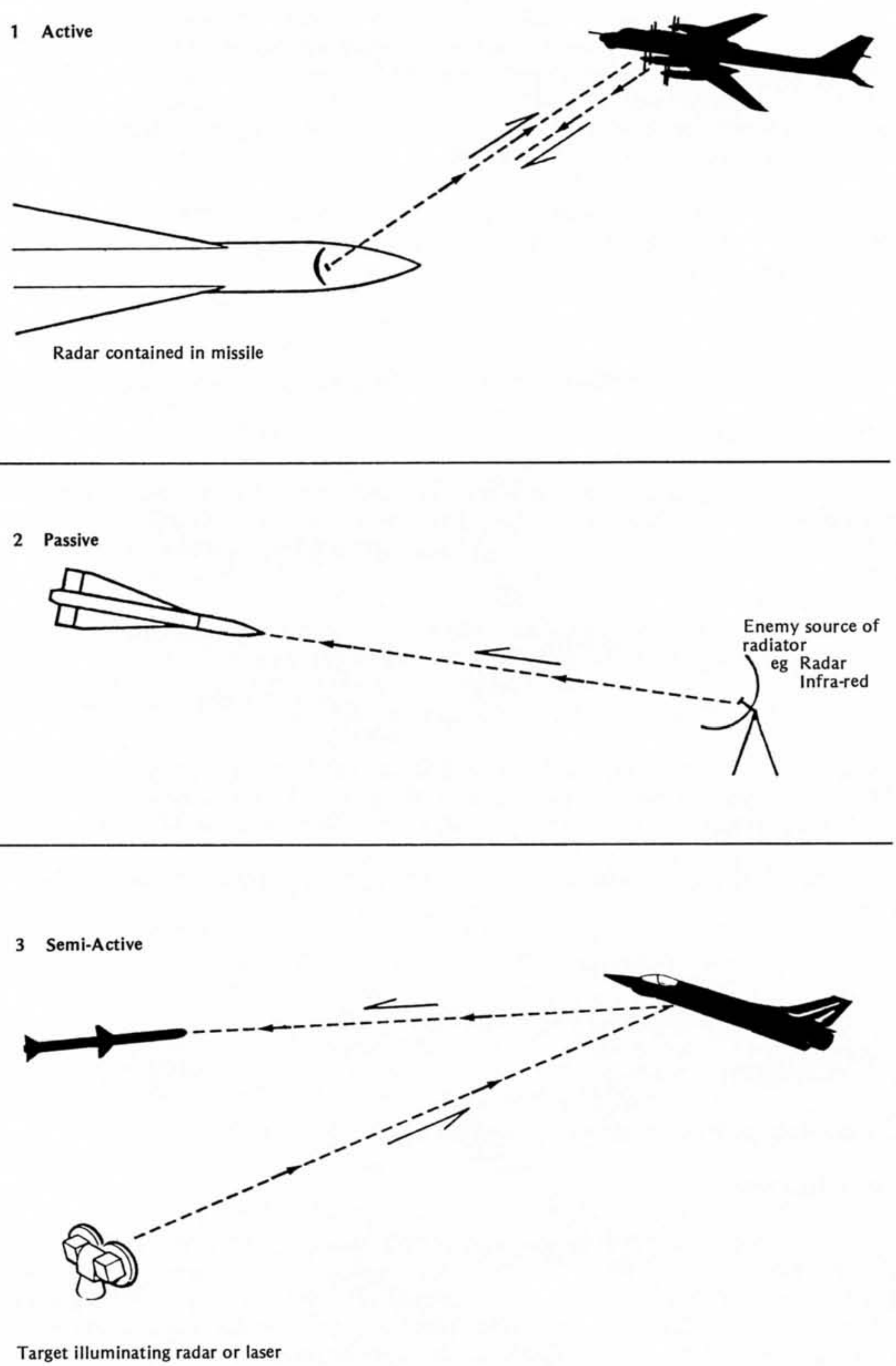
c. active homing.

These homing principles are illustrated in Figure 7.

PASSIVE HOMING

In a passive homing missile, the natural radiation of the target is used as the source upon which to home. In general, some form of proportional navigation law (as shown in Figure 4) is employed by the missile. This allows it to lead the target rather than chase it, thereby lessening the acceleration demands on the aerodynamic surfaces.

Fig. 7 The three homings



Passive homing systems, by their nature, are autonomous weapon systems allowing multiple engagements, and can have a valuable application especially with respect to "home on jam" or the terminal homing phase of a compound guidance missile. Combined with this is the fact that guidance equipment is relatively inexpensive especially when optical or infra-red wavelengths are considered.

A disadvantage associated with passive homing systems in general, and optical/infra-red systems in particular, is that they are not all-weather systems. Also, the detection range of the system is dependent upon target emmission and is not under the control of the designer, and the target must be clear against its background. Finally, as with all homing systems, the nose of the missile must be occupied by the target tracker, thus restricting placement of the warhead.

Passive homing techniques are employed in the Penguin and RIM11 missile using the infra-red signature of the target to home on.

SEMI-ACTIVE HOMING

In a semi-active missile system the target illuminating transmitter is located onboard ship or some other platform. The missile contains only the receiver and a guidance computer which makes the appropriate guidance decisions based on reflected energy received from the target. Again, a proportional navigation flight path is normally employed which steers the missile towards an expected intercept point.

The advantages associated with a semi-active guided weapon stem from the fact that the illuminator being based onboard another platform (ship) is not as restricted to size and power, and the transmitter is not lost with the missile. Also, accuracy is dependent upon the terminal engagement factors and is largely independent of range.

The disadvantages of this type of guidance are that the target must be clear against its background, and, since the missile is forward looking, it is susceptible to ECM techniques. The nose of the missile is again occupied by the receiver thus restricting warhead placement. Finally, present illuminators are tied to designating one target at a time, and while salvo firings are possible, multiple engagement scenarios can saturate the system. However, current work is being carried out which allows for the tracking and illuminating of several targets at once.

Standard, Sea Sparrow, Sea Skua, Sea Dart and the USSR's SA-10 are among some of the missile systems employing semi-active homing principles.

ACTIVE HOMING SYSTEMS

In an active homing system the missile contains both the target illuminator and its associated receiver, as well as the required guidance computer.

The advantage of a fully active system is that the missile becomes fully autonomous after launch allowing salvo and multiple engagements to be carried out.

The disadvantages of this type of system are based on the economics associated with the complexity of the missile, and the fact that all components are lost with each missile firing. Mutual interference can also be a source of problems if several missiles are released at the same time.

Coupled with this is the ECM susceptibility of the forward-looking missile and the expensive ECCM that must be introduced due to lack of operator control. Finally, these missiles tend to be large due to beam width/antenna size requirements while, conversely, size restrictions on the antenna limit the effective detection range of these missiles.

Exocet, Harpoon, RBS-15 and many other large and expensive missile systems employ active homing guidance during some period of their flight profile, usually during the terminal/engagement phase.

NAVIGATION/INERTIAL GUIDANCE

The principle of inertial navigation systems is one in which the acceleration and velocity vectors are measured by equipment contained within the missile. The forces are usually measured in three planes at right angles to each other, and via integration methods a relative displacement from launch point can be calculated by the onboard missile computer. Measured values are then compared with required trajectory data and the appropriate corrections are made to bring the weapon onto its final target position.

Missiles of this type require no outside guidance and, thus, cannot be interfered with by the enemy; likewise, there cannot be any mutual interference between missiles.

It should be noted, however, that systems of this type cannot be employed with mobile targets. The acceleration devices are costly, requiring high procession, and are lost with the missile.

Pure navigation guidance is employed in the various strategic ballistic missiles which have limited application towards shipboard systems other than submarine-based ICBMs.

However, Cabriel, Excocet, Harpoon and other anti-ship missiles combine inertial navigation guidance with other forms of guidance to attack "slow moving" targets such as ships. Therefore an acquisition phase is required by the missile as it changes over from, say, inertial to active terminal homing. This type of multiple guidance technique is known as COMPOUND GUIDANCE.

CONCLUSION

A large majority of guidance systems which are described in the written literature can be classified in accordance with the contents of this paper. Hybrid guidance methods, such as "terrain contour matching" (TERCOM), are somewhat specialized guidance procedures and outside the scope of this paper.

It is hoped that information contained within this article has stimulated professional interest among MAREs and will aid them in any future investigations into the GW systems aspects.

PROJECT MANAGEMENT SYSTEMS EMPLOYED ON THE CPF PROJECT

THE AUTHOR

Commander Peter Child is currently the Planning and Control Manager of the Canadian Patrol Frigate Project. He joined the Royal Canadian Navy in September 1959 and is a graduate of RMC with a degree in mechanical engineering with subsequent qualification as a marine engineer and a naval architect from the Royal Naval Engineering College and University College, London, England. He has held a variety of positions in ship design and ship repair in headquarters and in the field. He assumed his current duties in April 1982 during Contract Definition and has taken the management systems through evaluation and negotiation. He is now engaged with their implementation. This article is a variant of a paper presented to the Eastern Canadian Section of SNAME in April 84.

SUMMARY

The aim of this article is to provide an insight into the project management activities which are required to be performed by the Prime Contractor and the Government for the Canadian Patrol Frigate Project by providing a brief description of the management processes to be employed to monitor and control the project.

INTRODUCTION

The CPF Project is the largest, most technically complex government procurement ever undertaken in Canada by the Federal Government. It will span nearly a decade, involve hundreds of government personnel and thousands of people in Canadian industry. As a result, the Government will be involved in a very complex and lengthy task of contract administration and project management.

The problems associated with the achievement of the project objectives within the constraints is the challenge to be met by the project management systems. The following sections will address those systems which will be employed by the Contractor and by the Government Project Management Office to discharge their responsibilities.

MANAGING THE PROJECT

The CPF contract is a performance oriented contract with the contractor committed to the provision of the end items which will meet the contract specifications. The contractor has been provided and has accepted total systems responsibility for the implementation and this includes full responsibility for the integration of all the different elements and systems. It must be noted tht in addition to the more normal cost, schedule and performance considerations, the prime contractor has commitments to Canadian industry in the form of both direct and indirect or offset benefits and the influence of these considerations in the decision process cannot be overlooked.

CONTRACTOR MANAGEMENT SYSTEMS

The management systems which were negotiated into the prime contract and which have been subsequently flowed down to subcontractors are based upon the desire to utilize the management systems which were in place within the existing corporate entities, expanded and developed as necessary to reflect the size and scope of the CPF project. The contract contains the corporate plans for the implementation and use of the management systems; it does not describe the procedures which will be implemented and invariably modified as the corporate experience grows. The contractor has undertaken a commitment to these plans and will demonstrate to the government how he is satisfying the requirements. It is worth emphasizing that it was not the intention of the government to impose management process on the contractor, what was intended was the commitment of the contractor to management systems which were mutually agreed to be necessary to the implementation of a project of this magnitude and the provision of government visibility into these management processes to permit the discharge of government responsibilities. Each of the following systems will be briefly described.

a. scheduling systems;

b. cost/schedule controls;

c. configuration management;

d. data management;

e. materiel management;

f. subcontract management;

g. risk management; and

h. reports and reviews.

SCHEDULING SYSTEMS

The provision of an implementation schedule is a necessity for any project. Where this project exceeds the ordinary is in the scope and complexity which the schedule must adopt. All of the areas, all of the work and all of the tasks to be performed must be appropriately scheduled to ensure that the work is performed in a timely fashion. This requires a fully integrated schedule which must control the whole project; one which controls the activities in all areas of the project and which also controls activities in the subcontractor facilities and the myriad suppliers and vendors. The schedule must include a network of all the activities with the interactions registered. The schedule system must be capable of critical path analysis and of what-if analysis. The requirements of the scheduling process are not strange - the scope is. The use of the term "control the activities" is perhaps too strong for scheduling - the process will order the activities and provide the production requirements/targets. Control is exercised by management using the schedule as but one of their tools.

COST SCHEDULE CONTROL SYSTEMS

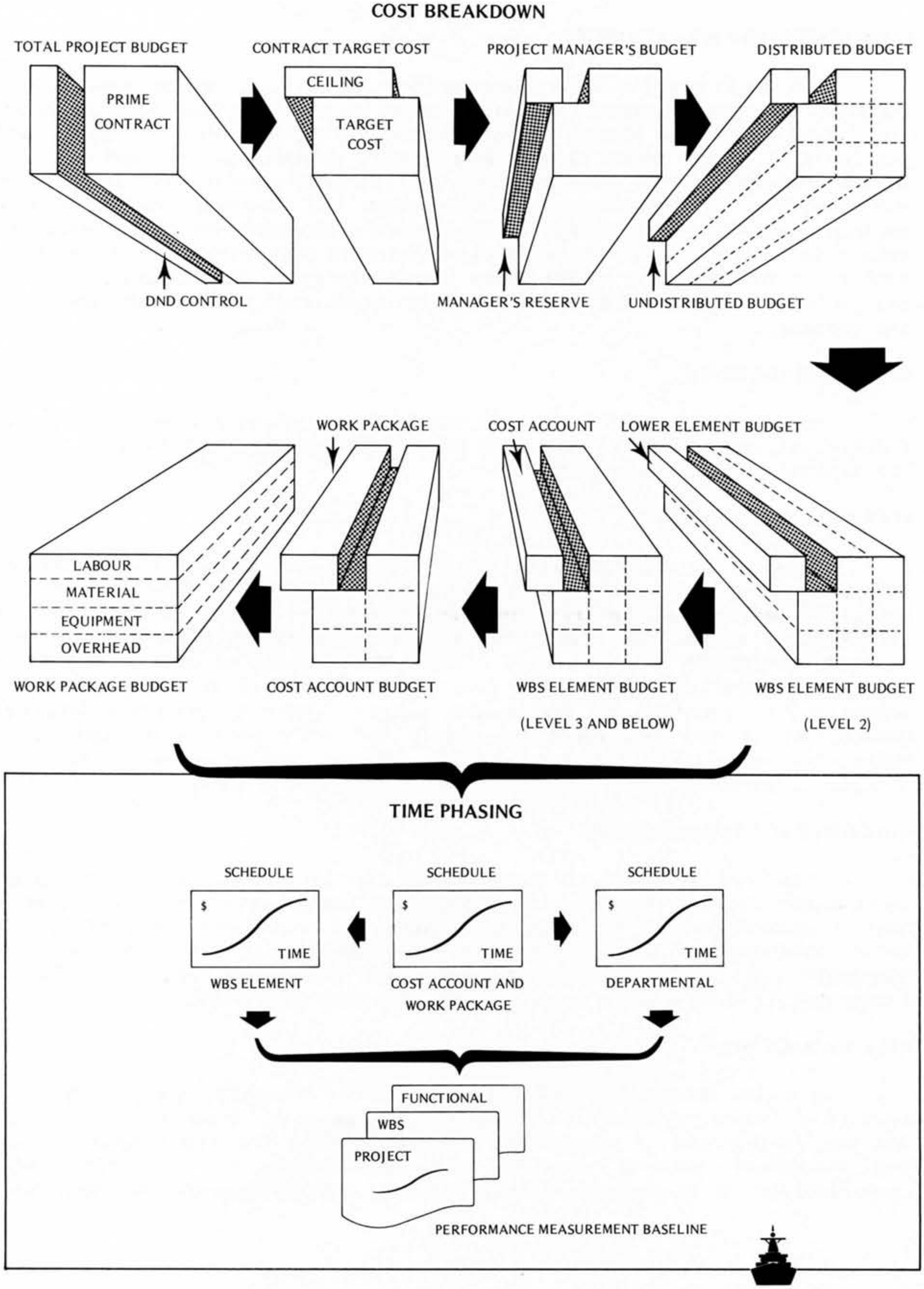
The cost/schedule control system (C/SCS or CS squared) is the main tool by which SJSDD will exercise management control of the project. Despite its name, it is not a finanicial control system: it is a management system which tracks performance against plan and permits the assessment of variances and the projection of trends. The tracking medium is money since this is a common denominator which can be used to expresss the use of materiel, equipment, labour and overhead.

The cost schedule control system employed in this contract is modelled after the systems employed by the United States Department of Defence and the United States Department of Energy. It is not a system in itself, rather it is a set of criteria which a number of control systems can meet, and a formalized reporting process. The criteria require three building blocks, a work breakdown strucure, a schedule and a budget of work elements.

The C/SCS to be employed sees the project budget divided, through the process depicted in Figure 1, into cost accounts, work packages and task elements. These elements are then phased over time through the schedule system giving a budgeted cost of work scheduled over each time period. These costs may be rolled up through the work breakdown structure to provide a project overview. The recording and comparison of the actual costs will measure progress against plan, and an analysis of the variances and trends at various levels within the work breakdown structure will provide management with the information necessary to focus on current and/or projected problem areas.

COST AND SCHEDULE BREAKDOWN

FIGURE 1



CONFIGURATION MANAGEMENT

The configuration management process to be applied on the project embodies the establishment and maintenance of a discipline through which the integrity of the design is maintained throughout the life cycle and particularly in the detail design development, production, test and delivery of the elements of the project. The initial configuration of the project was described in the contract documentation and drawings, and this will explode downward as the design is detailed and expanded and will eventually result in control of all items to the repairable-part level. This level of control is necessary to ensure class identicality, to permit integration of all project elements and to allow the life cycle configuration management of the vessels.

DATA MANAGEMENT

The data management system is required to control all of the recorded information, regardless of its form or characteristic as it evolves during the implementation of the project.

MATERIEL MANAGEMENT

Through its contract with the government and through the nature of its subcontracts with the other shipyards, SJSDD will provide all the materials and equipments used in the production of the ships with the exception of combat and electronic systems supplied by PARAMAX, some few items of government supplied material, and the consumables used in construction. The critical nature and complexity of this task is evident and emphasized by requirements for vendor data in order to progress detailed design, and by the requirement to supply two other yards with their work materiels. The potential for schedule impacts and delay and disruption charges is obvious.

SUBCONTRACT MANAGEMENT

This area is one which marks one of the largest extensions for SJSDD in that the contract requires the acquisition, manipulation and control of a host of subcontractors in order to achieve the contractual objectives and their commitment. The problems in this area centre on the size and complexity of the subcontracted work and the requirement to totally integrate all this work in order to meet the SJDD commitments.

RISK MANAGEMENT

The risk management system is a system to identify, analyze, report, track and reduce or eliminate risks to program cost, schedule performance and the achievement of industrial benefits before the risks materialize. The management process requires risk assessment and the continuous re-evaluation of postulated plans, options and commitments to determine reasonableness and acceptability. A properly operating risk management system will preclude significant surprises.

REPORTS AND REVIEWS

Although the requirements for reports and reviews are very real they cannot be classified as a management system. There is a need however to manage their production and delivery. The early detail design stages of the project see the development and establishment of the configuration of the end items and it is through the reports and reviews that the government gains insight into the contractor's progress and intentions. The reports and reviews are the means whereby the government will identify progress and problem areas and then move toward a mutually satisfactory resolution.

The systems described above do not provide an exclusive listing of the management systems and processes which will be utilized by SJSDD in the execution of the CPF contract. They do, however, represent some of the major systems being employed, and will serve as the focus for the following discussion on the government responsibilities and systems.

GOVERNMENT MANAGEMENT SYSTEMS

The government team which has been formed to manage the CPF Project is tri-departmental in nature. Since the departmental responsibilities afforded to the Department of Supply and Services (DSS) for contract management and to the Department of Regional Industrial Expansion (DRIE) for industrial benefits follow the traditional lines they will not be discussed in depth at this time. The concentration will be on the responsibilties of the lead/client department, the Department of National Defence.

As the lead and technical authority for the CPF Project, the Project Manager is responsible for:

a. the achievement of the government objectives;

b. the coordination of all government contributions;

c. the development and implementation of cost, schedule and performance objectives; and

d. controlling the work performed by the contractor.

These responsibilities require, for their discharge, the use of the management systems which have been contractually described. Although all of the systems are necessary, only three of these (the scheduling system, the cost/schedule control system and the configuration management system) will be discussed herein since the requirements for, and the use of, the other systems is quite obvious.

The scheduling system is of prime importance to DND for the coordination of the government contributions to the project. As has been earlier noted, the contractor has a commitment to cost, schedule, performance and industrial benefits. In order to exercise this responsibility, the contractor must have the flexibility to adjust his schedule as required to resolve scheduling problems as they arise. The schedule is not totally flexible in that certain key events have been designated in the contract as milestones and these are tied to financial benefits. Beyond these milestones the integrated schedule is under contractor control.

In addition to containing the activities of SJSDD and its subcontractors vendors and suppliers, the schedule contains a number of activities in which the government must participate. The range of these activities spans direct involvement such as the supply of material and information; through the supply of resources such as personnel for the training courses and for crews for trials; through the orchestration of interactions, such as participation in provisioning conferences and design reviews; to the provision of progress and status to complementary and interrelated projects within the rest of DND. The contractor must have an integrated schedule to ensure that all aspects of the project are progressing satisfactorily and DND must be able to integrate its activities with this schedule in order to respond to the requirement. The contractor and the government cannot operate in isolation, particularly since the contractor will be modifying his schedule to resolve risks and other problems and these changes will impact government requirements as well.

The cost/schedule control system will present an integrated view of progress against plan on a monthly basis. This view is available to the lowest level at which the work is managed; however, in its reports to the governemnt, the contractor will be reporting at a summary level. DSS will use the system to track costs and schedule within the contract and are responsible for the assurance that the data reported is of consistent accuracy. DND will use the system outputs to trace the variations between planned and actual progress, to establsh trends and, by integrating this information with technical progress reports, will be in a position to highlight those areas of the project where problems either exist or are developing and direct appropriate attention.

The Configuration Management System has two dimensions which are of interest to the government. The first, which involves the contractual description of the ship, is of direct interest to DSS and is of interest to DND in that the performance specifications contained within the documents describe the product and the standards which will be used in determning acceptability. This dimension is controlled through the control exercised by both the contractor and the government over changes to the documentation be they technical or non-technical.

The second dimension of the Configuration Management System is of prime interest to DND and is more related to the life cycle management and support of the ships and their support systems. Using the contract specifications as the baseline the design will be developed in ever-increasing detail and, at appropriate intervals the design of each system will be "frozen" at functional, allocated and product baselines through a design review process. The systems, as they pass these milestones, are named as configuration items and changes are controlled. This is most necessary to ensure that the system interfaces and the integration requirements can be established and maintained. The resultant description of the class of ships will be used in the life cycle maintenance and support of the ships.

CONCLUSION

This article has addressed the management systems which will be employed in the implementation of the Canadian Patrol Frigate Project and how the government will use these systems to discharge its responsibilities for the management of the project and the admistration of the contract.

The management systems will have provided no surprises to those involved in the management of major and diverse projects even though they may be more recognizable under other names. The requirements of managers have not changed - they still need accurate and current information and a means of separating the expected from the unexpectd. If in the provision of this insight into the management process to the Canadian Patrol Frigate project I have reinforced the belief that nothing is new in the management of this from any other project, only the scale and complexity is different, then I have accomplished my aim.

One of the biggest impacts that this project will have on the management of future projects is the development of automated data processes for the management of data. With automated data systems, the configuration and operational experience of each of the ships may be tracked throughout the life cycle which will ease the problems of both the Government and of Industry when it comes time for overhauls, refits and the half-life modernization of the ship class.

The automated data processes and management information systems purchased for and used by the CPF Project will be used on future projects implemented on behalf of the Navy, and there is a strong possibility that these systems will gain use throughout the Department of National Defence on both major Crown and the capital projects. These systems will provide the capability of absorbing seemingly vast amounts of infomation and, through appropriate reduction, will permit management by exception.

Promotions

The Journal would like to acknowledge the promotions of the following MAREs to the ranks indicated.

Commodore	J.A. Gruber
Captain	C.K. Baker
Captain	P. Child
Captain	R.R. Richards
Commander	L.F. Porter
Commander	D.J. Hussey
Commander	M.E. Lambert
Commander	P.A. Cadeau
Commander	G.A. Towill
Commander	F.W. Gibson
Commander	J.H. Murchie
Lieutenant Commander	D.G. Faulkner
Lieutenant Commander	D.P. McVicar
Lieutenant Commander	E.G. Bramwell
Lieutenant Commander	D.G. Dubowski
Lieutenant Commander	R. Portolesi
Lieutenant Commander	K.G. McLaren
Lieutenant Commander	R.A. Wall

Good Luck in your new positions and ranks.