PERSONNEL AFFAIRS

PART II

BY

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RATING PROBLEMS

Having worked downward, institutionally, to meet the problems pressing upward from ' the men on the job ', it is appropriate to examine some of these in detail, and to leave other more ' umbrella ' subjects, affecting all personnel, until last.

THE STOKER MECHANIC BRANCH

There is no doubt that one of the most important problems was, and is, the reconstitution of the Stoker Mechanic Branch as the Engineering Mechanic Branch.

In 1953, the state of the Stoker Mechanic Branch was so bad, for numbers and quality, that it had become the measure of the Fleet. Every device and expedient was used to support it. Inflation by N.S. men, producing no supervisory ratings, and the institution of Temporary Manning Standards and Temporary Peace Complements, added to the heavy burden of the fewer and fewer senior ratings. The P.O.S.M. and the man with ' 7 years + ' were the focal points, the former being the backbone of the Branch, just as it could be said that the commander is the backbone of the officer structure. Re-engagement and transfer rates, within the Branch, were as depressing as enlistment.

During this critical period the Admiralty climate of thought was interesting and illuminating. So long as N.S. men, a purely political device, existed there was a considerable desire by Departments to grasp at the expedient they offered. National servicemen were available and their use avoided, or postponed, the alternative of approaching the Board and the Treasury for radical improvements in pay and conditions of service for regulars at a time of considerable economic pressure. There were a few notable exceptions to this view who welcomed an opportunity to force the issue.

Impact of Material Matters on Personnel Affairs

The Hoare Report

About this time, the Hoare Report on the maintenance of the Fleet was circulating in the Admiralty and causing considerable reverberations, for not only was the technical manning situation becoming inescapably desperate but the true material state of the Fleet was being shown up by the hard facts of particular cases. The Hoare Report did not stop at material, but related material conditions to personnel—especially the P.O.S.M.

The Dalton Report

In this situation the Dalton Working Party was set up to examine the whole state of the S.M. Branch in the context of existing difficulties and future requirements. The Report, produced in March, 1954, recommended many changes, Branch and Naval, and its detailed recommendations have been dealt with, point by point, over the past two years and are still ' in hand '.

The main points in the Dalton Report may be summarized as :—

(*a*) Dropping the out-dated title 'Stoker' which, by association, was believed to be causing harm to recruiting.

(*b*) Reconstituting the Branch as the Engineering Mechanic Branch which, by a series of training steps, would be capable of semi-skilled maintenance as well as operation. To make these steps progressive, a new course for P.O.M.(E)s was recommended and has now been started at H.M.S. *Sultan*.

(*c*) Removing the unfair burden of dirty work from the Branch so that it could give its best in operation and maintenance.

(*d*) Providing an outlet to Branch or S.D.L. officer.

This concept matches the national-naval need to use individuals to their maximum capacity by giving them both the opportunity and the training. The effect of this scheme will be, when fully instituted, an overall increase in the skill available to the Engineering Branch as a whole. Furthermore, the Engineering Mechanic Branch will allow the Artificer Branch to be developed and used to much better advantage. The E.R.A. is already being freed from the traditional, narrow bondage of throttle watchkeeping in order to carry out the wider, truly skilled work of tracing incipient faults, adjustment and control of running machinery, preventive maintenance, etc. Similarly, the P.O.M.(E) will eventually be emancipated from his fan and pump controls and will be in charge of the boiler and engine rooms in a fuller and more responsible sense.

Finally, it is the intention of the full reformation to break a way through the dead-end of the S.M. Branch and provide an outlet for the M.(E) Branch to the Special Duty List. The creation of a Special Duty List of officers undoubtedly makes the outlet for the M.(E) very much easier to effect than before such a list was contemplated. This is a good example of the inter-relation of events in personnel affairs.

Dirty Work—Ship Design

Considerable progress, from the material as well as the personnel aspect, has been made in tackling the problem of dirty work by such means as the Hull Maintenance Working Party, etc. More tank cleaning vessels and more equitable responsibility for maintenance are helpful in this problem but, fundamentally, it would seem that a ship designed for maximum effective use by her company would automatically have a minimum of dirty work. It would, in this connection, seem that ship design might be better related to the effective employment of men if it was not divorced from direct man-power and user responsibility.

There is no doubt that though much has been done, and is in hand, to improve living conditions afloat and ashore, they remain a source of loss for re-engagement or transfer and it will be no good merely assessing this as a problem to be tackled by A.s and A.s. It is a problem of design and part of the functional reformation now required.

Complements

Under these circumstances of poor quality and low recruiting rates, it was the policy of the Engineer-in-Chief to press for fewer but properly manned ships and thus break the vicious downward spiral of fewer men, more work, worse conditions and less desire to re-engage or transfer. The only alternative was to insist that reduced reliability, operational capability, and a lowered Branch

morale must be accepted. It is of interest that one executive realist, in a department directly concerned with man-power, did much, at this time, to help the E.-in-C. by observing that ' a requirement does not cease to be a requirement simply because it cannot be met '. There are two points in this : first, that personalities matter very much in personnel affairs ; second, that it is essential to state the obvious.

There is always a danger that lessons learnt in hard times will be disregarded as soon as times are easier and the ' price ' must therefore be stated at all times. It could be said that technical departments have not always been good price-fixers in the past, especially over personnel matters, but it is only by stating a price that problems such as this are forced up for decision at the appropriate level. This obvious fact clearly demonstrated the true situation within the Engineering Branch and brought the price clearly to the notice of the Naval Staff. No longer was it tenable that the E.-in-C. was short of stokers ; it was the Navy. Furthermore, the shortage concerned individual men, and not just numbers and statistics. It is vital at all times to retain this non-branch, human outlook in personnel affairs. In better times, it is all too easy to relapse into the coldly statistical branch attitude.

Effect of Planned Maintenance on Complements

The introduction of planned maintenance and the Class Authorities at last provided a factual basis on which to re-evaluate complements with respect to the maintenance task. Up to this time, the Engineering Branch complements had, first, been based upon the purely watchkeeping commitment. Later a system based on the ' Caslon Rules ' was used. The purpose of the ship, whether ' harbour ' or ' sea ' was the measure, and then the actual ship ' state ' was taken to assess the maximum man-power required. In nearly every case this was found to be the Defence Cruising State. The Caslon Rules took into account the day-work commitments, but there was no factual assessment of the maintenance task and complements, and from this important point of view, they were really framed on tradition and rule-of-thumb.

The re-evaluation of engineering complements resulted in formidable increases in certain ships and considerably affected accommodation and living conditions. The balancing of the two requirements, adequate man-power and acceptable living conditions, persists as an acute problem which will remain, in the writer's opinion, as long as present ship design philosophy and procedure persist. However, acceptance by the Staff Divisions of a Maintenance Specification in the design stage, and the recognition, at long last, of a maintenance responsibility for the Fleet by all concerned, have done much to bring this matter into a proper perspective. At least it is being approached as a problem that is known to exist.

The Maintenance Organization Section : Material and Personnel

It has already been observed that the balance between material and man-power is one of the dilemmas of politics (automation is really just this issue) ; it was not surprising, therefore, to anyone who looked at material as a means to serve man and not an end in itself, to find that the newly-created Maintenance Organization Section in E.-in-C., Bath, became involved in complementing, accommodation, training and other personnel matters, at a very early date.

Before the Hoare Report and the consequent formation of this section, complementing was handled, at first level, by the Design or Maintenance Sections concerned (for new construction or running ships respectively). The Personnel Section, in London, only dealt with the complement as a whole and

with the particular points of general ship duties within this complement. It was difficult, therefore, to create and maintain a general complementing policy within all the various technical sections, the lack of any one co-ordinator at Bath often made the complementing task very difficult at the London end.

The Maintenance Organization Section, moving into the field of complements via the Class Authority maintenance evaluations, has begun to apply a scientific method of considering complements (*Journal:* Vol. 9 ; No. 4—' Maintenance Evaluation ' ; Cdr. Osborne). This, in the writer's opinion, is an example of the functional approach to personnel problems, stemming from the task to be done. It is, of course, a highly controversial subject and the application of formulae to any personnel problem is fraught with danger. Nevertheless, it is only by such an approach that the main factors can be appreciated objectively and questions of definition, hitherto submerged, can be brought to the surface for close examination, e.g. the method of doing certain jobs, the type of man to do them, the training required. But one must constantly remember that the subjects of any formulae in such scientific methods are, in this context, human beings and individuals.

It is of particular interest that the Royal Canadian Navy, as part of a Tri-Service review of man-power in the early 1950s, carried out a Job Analysis in order to establish a factual basis on which to erect new schemes of branch structure, pay, and training. (' R.C.N. Engineering Branch Reorganization'—Lieut.(E) F. C. Moore, R.C.N.—*Journal:* Vol. 10 ; No. 1). It would seem that the Royal Navy is now groping its way downward to find such a factual basis without, as yet, recognizing that a form of job analysis offers this. The need for some such analysis or task evaluation, will be referred to later in considerations of artificer training.

Finally, in this consideration of the relation of material to men, it is pertinent to remark that the present ' Vote ' system makes no allowance for balancing debits in one vote (e.g. more effective but more expensive man-power) against credits in another vote (e.g. less maintenance cost because of more effective operators and maintainers). One is at liberty to wonder whether a system of financial control devised for *laissez-faire* conditions is appropriate, efficient or realistic for present and future conditions of our technological society.

ARTIFICERS

Just as the reconstitution of the S.M. Branch has been a constant problem over the past few years, so the future of the Artificer has posed a similar question. What should he be and how should he be trained ?

Against a background of falling numbers and decreasing quality of candidates for entry, a relatively high failure rate under training, and, very recently, the realization that the future Special Duty List demands a continual supply of the right type of ex-artificer apprentice as officers, this subject is now of vital concern for the health of the whole Engineering Branch. The General List conception can only be realized, in fact, if sufficient S.D.L. officers are forth-coming to provide a stabilizing buttress for the G.L. This necessitates a flow of highly-trained, intelligent, responsible men as artificers. The effect of the New Pay Code remains to be seen but, with things as they are, it may take a long time to see any appreciable effect on entry or re-engagement numbers, both of which have declined dangerously (pre-war re-engagement of artificers, 80–90 per cent ; present 40–50 per cent).

Education, Training and the Artificer

The Navy competes with Industry and the other Services for artificer apprentices under conditions of full employment and the welfare state. The old security advantage, offered by any Service in conditions of unemployment, has gone and the pre-1944 advantage of becoming one of the 20 per cent (approximately) in the country to be given secondary education is fast disappearing, in fact as well as in theory, as the 1944 Education Act becomes fully established. Thus the naval artificer could be said to gain nothing in comparison with his industrial counterpart. Educationally he has no comparison, no yardstick ; for the present training system for naval artificer apprentices is not yet geared to any national standard such as the Ordinary National Certificate, whereas all industrial schemes of apprenticeship pay great attention to encouraging every individual to develop himself educationally as much as possible, in many cases by such stimuli as bonus and payment of fees.

Apart from this naval-national comparison for educational standards, the actual naval requirements, in terms of ' know why ' as well as ' know how,' have been pressing hard upon the existing training system, especially for the Ordnance, Electrical and Air Branches. These Branches need artificers whose technical education and training will equip them to be able not only to repair and maintain the highly complex machinery and equipment now coming into use to meet Staff Requirements, but speedily to diagnose, locate and correct faults or causes of sub-standard performance in intricate circuits and systems. To perform these tasks, a knowledge of the scientific principles upon which the application is based is essential, in varying degree, as is an understanding of the techniques and technology involved in the manufacture. It is evident that a thorough grasp of the operation of the system, machinery or equipment is as essential for tuning and testing, as is an ability to strip and reassemble the components.

All this forces an increase in academic and technical education ; the balance has to swing much more towards ' head '. Within an overall scheme of training tightly compressed by time, such an adjustment can only be effected at the expense of craft training. ' Hand ' has to give way to ' head '.

On examining the craft training given to naval apprentices one is struck by the traditional pattern which is followed. It has remained virtually unaltered since its first introduction, though the test jobs themselves have become lighter and more machine work has been introduced to replace the hand-slogging of earlier days. A recent article by Lieutenant Card (' Passing Out Test Jobs '—*Journal :* Vol. 9 ; No. 4) gave an excellent account of the Admiralty Test Job System and it is only necessary to emphasize here that the Navy possesses the only real test job system of training for craftsmen—with its own standards. There are no standards in Industry and many firms strongly dislike any system of training which relies upon test jobs as such.

Re-Formation

In trying to relate the trained man and his task to the training method, it is evident that, though there are many opinions, there is all too little fact. As stated earlier, it is becoming clear that a more informed, objective evaluation of the tasks to be done is urgently required before any realistic rationalization of craft training can be undertaken.

In the meantime much could be done, and is intended, by such measures as :—

(*a*) Effecting a closer relation between Part I and II craft training so that the whole develops as smoothly as possible.

(*b*) Altering the form of craft training so that the final test job hurdle is eliminated by the introduction of progressive test jobs which are, themselves, both interesting and satisfying.

(*c*) Standardizing the test jobs and marking systems for artificer apprentices, mechanicians and direct entry artificers.

(*d*) Developing a comprehensive record system and analysis for craft training progress and results, so that individual and collective difficulties can be appreciated and training methods adjusted.

Standardization of Test Jobs and Marking

Of the above points, all are in hand generally for artificers and mechanicians, and H.M.S. *Sultan* has made some notable progress in (*c*) and (*d*).

A recent article by Commander Elvin (' The Mechanician, 1905–1955 '—*Journal :* Vol. 8; No. 4) has dealt with the important subject of mechanician training, where much has been done and this will, therefore, not be discussed here.

Reverting to the requirements of the artificer of the future ; so far as craftsmanship is concerned, it seems evident that the boilermaker and the coppersmith, as such, are obsolescent and that a more comprehensive trade of metal worker is more realistic to the Navy's needs. Considering fitting and turning, there is undoubtedly a major need for fitters who can also deal with light turning, and for a smaller proportion of highly-trained machine-tool operators with reasonable fitting ability.

The artificer trade structure has, therefore, been very much under review along these lines and syllabuses are being revised to train the new trades indicated. Generally, it can be said that the original balance of some 75 per cent craft : 25 per cent academic training is swinging towards a 50 : 50 division, but it is not intended that the craftsmanship of the artificer should be devalued proportionately. E.-in-C. has always considered the artificer to be the key man of the Branch, and has always valued him as such because of his craftmanship, whatever over-training may have been built into him being regarded as an essential insurance against times of emergency or war. This reduction in pure craft training must, therefore, be balanced against improved methods of such training and against the increased technical ' know-how '. It is becoming increasingly obvious that the words ' artificer ', ' craftsman ' and ' technician ' require careful consideration and relation in definition and value for naval needs.

Reports on Artificer Apprentice Training

Over the three years 1953–6, so many problems arose concerning artificer apprentice training that the Engineer-in-Chief set up a small committee of one commander, one psychologist, and one industrialist to investigate the system against the background of conditions in Industry and the Navy as existing and foreseeable, and report their conclusions to him. It is interesting to note that a national survey of apprentice training schemes in certain industries and trades is being carried out for the Department of Scientific Industrial Research and that this survey has included the Naval Artificer Apprentice Training Scheme as part of the Services efforts.

The Child Report

The last report, known as the Child Report, on artificer training was made in 1946, and was conducted by the Department of the Senior Psychologist,

Admiralty. This greatly helped in introducing ' series training ' and the present procedure of interview and aptitude test. The results of this training are only just being appreciated in the Fleet but it is believed that a broader, more progressive spirit, based on inter-branch co-operation and chief petty officer status rather than on narrower craft loyalties has grown up from this form of entry and Part I training (very much as it is hoped that the General List will grow from the new form of 18-year entry and training). Whatever may be recommended for the actual training of artificer apprentices, E.-in-C. is determined that series training must remain, with common entry and branch selection in Part I.

Ministry of Education and D.N.E.S.

At Admiralty request, the Ministry of Education recently inspected the artificer apprentice training establishments and recommended adjustments to make possible the granting of Ordinary National Certificates to those who could qualify during the course. The O.N.C. course is now being adopted as the basis for artificer apprentice training and the syllabus is being adjusted and the necessary laboratories are being built. The more able apprentices, at least, will be able to take the O.N.C. examination, and the less able will greatly benefit by practical demonstration which is essential for the proper appreciation of scientific principles upon which their value now depends.

The course should, therefore, meet both naval and national pressures in :—

(*a*) Accepting and introducing a national educational and technical yardstick into naval artificer training ; this should not only help recruiting but will also be of value to individuals going into industry on retirement.

(*b*) Developing the more able apprentices to the best of their capacity.

(*c*) Giving an improved balance between ' head ' and ' hand '.

But it must be appreciated that the real virtue of the Certificate is that it satisfies naval pressures. It would be misleading to adopt this course simply to satisfy outside pressures (e.g. poor recruiting). E.-in-C. has strongly advocated that recruiting apprentices now demands attention by a section within the Admiralty on the same lines as that introduced, successfully, for officer entry and this has now been accepted.

Once again, one can see that the effects of the 1944 Education Act have been felt : the individual has become the focal point and is given full facility for development. He is no longer allowed what education is considered sufficient, and the Navy, even for its own purpose, has found it expedient to come out of isolation and adopt a national standard of technical education.

Training and Educational Organization

There is undoubtedly a great need to provide an overall administrative organization for education and training, whether of officers, artificers or mechanics. At present, for artificers alone, there are some twelve departments or divisions directly concerned ; each of these can express a separate view on any subject for final analysis by non-professionals. There is no standing body or committee to consider or advise on such things as craft training, and even the Admiralty apprentice training schemes for dockyard apprentices and artificer apprentices have proceeded in complete isolation up to the present. If one considers the managerial and supervisory strength of a large firm, it becomes fairly clear that the weight given to education and training in the Admiralty badly needs expansion and more effective use.

As has been said, education is the very stuff of personnel affairs and is the measure of our technological way of life ; there is need for this to be recognized in any effective administrative organization today. Particularly is this so, where the most effective and efficient use of material depends upon sound maintenance and where design, maintenance, operation, and training are all equally important and inter-related. There is a need, in the writer's opinion, to integrate the training with other aspects of material in the design stage and this cannot be achieved so long as education and training are not effectively represented, functionally, within the organization.

There is also the point of view that education is at present a specialist field and that, whereas educationists are often engineers or scientists, no naval engineers are as yet recognized as educationists. This lack could become more noticeable as educational pressures increase within the Admiralty.

Future Role of the Artificer

To round off this appreciation of the ' Artificer of the Future ', it can be assumed that :—

(*a*) He will still be required as a craftsman, but to suit a different trade structure.

(*b*) The artificer branches will be the main source of the S.D.L. and must, therefore, be capable of producing the quality and quantity required.

(*c*) The training given must meet naval requirements, which are now at least equally ' technical ' and ' craft ' ; but a more factual assessment of the training objective is needed, e.g. by a form of job evaluation or analysis.

(*d*) The artificer will be freed from throttles and other restrictive operational roles and will be required for general supervisory work, for trouble-shooting, diagnosis, testing and tuning of complex systems and equipments.

(*e*) The artificer embraces the craftsman and the technician, crossing from one to the other at some stage in his career depending upon the job he fills in the complement, e.g. the Ordnance Artificer of a small ship ; the Chief Artificer of any Branch in a ship. Some branches provide training at the fourth class rate for the third class and/or for chief artificer : it would appear that it will be necessary to consider the introduction of such advanced training for all artificers, and to take account, at this stage, of the production of instructors, specialists, and even dual-specialists in certain essential fields of technology.

In the Artificer Branches it would seem advisable to reform training on the same lines as in the new M.(E) Branch so that there is a progressive, layered form of training, operation, and advancement, continued to a much higher level than in the present where, for E.R.A.s, all training ceases after the fifth class (except for I.C.E.).

Sea Training

A recent achievement has been the recognition that fifth and acting fourth class artificers are training rates. Accommodation difficulties have, however, emphasized doubts concerning the value of this sea training under existing regulations. Much consideration has been given to its timing and its form, and it is possible that this valuable year of non-effective time could be used to better advantage for the individual and the Navy by a re-evaluation of the whole existing scheme of artificer training. Whatever form of sea training is

finally decided upon, it is quite certain that it must be purposeful and satisfying to the individual. Nothing is worse than a period of training the object of which is not well understood by those in charge or under training.

CERTAIN PARTICULAR ASPECTS OF TRAINING

Some particular subjects, affecting all categories, demand mention in their own right. Of these, I.C.E. training, and leadership will be considered because they have occupied so much time, thought, ink, and words during the past three years.

I.C.E. Training

While continually attempting to resist an open split between the ' steam ' and ' I.C.E.' functions in the Branch for the obvious reasons of flexibility of man-power and equal opportunity for advancement, etc., E.-in-C. has been aware that, in fact, ever widening cracks are being papered over. There is, therefore, great need to provide the best fundamental training for all ratings and to make specialist training, developing from this foundation, as rational as possible.

A review of I.C.E. requirements and training methods led to the conclusion that the latter needed to be made more rational by cutting out redundancy and adopting a layered form. To do this, the basic courses, for junior and senior ratings of each branch, were reformed and reduced in content and duration, so that the essentials of operational and maintenance requirements appropriate to the rating categories, were covered. The basic courses are designed round basic engines as illustrations of applications of principles.

With the closing of H.M.S. *Alaunia* and the grouping of mechanical training courses at H.M.S. *Sultan*, the M.T.E., Chatham, has naturally taken the weight of all I.C.E. training. With this centralization it is, of course, much easier to co-ordinate and to prevent overlap in training.

A series of Engine Type Courses has been introduced for particular types of engines and will follow the Basic Course for senior ratings, being in effect, a part of a series of Ship Type Courses which has been started in *Sultan* to cover the actual installation. They are essential pre-commissioning and pre-recommissioning courses for ratings who have no previous experience of the engines and installations concerned.

Leadership Training

There is no doubt that the educational reformation of 1944 has widened and deepened existing concern over leadership because of the fundamental principle of ' equal opportunity for all ' which, in effect, means that leadership is no longer a ' closed shop ' for a certain section of the community. If education is looked upon as education for the business of life, then there is little *mystique* about it and one appreciates that secondary and university education are, in fact, ' Education for Leadership '—or should be. Hence the closed shop for leadership in ' the bad old days ' was really the Public and Grammar School, with the odds on the Public School because it was residential. If, therefore, the aim is to allow all to have an equal opportunity for leadership, then all require the type of education which has, hitherto, been proved to be most successful in producing leaders. But this begs the question of the type of world, or people, in or amongst whom the leadership is to be effective ; at this point the clash of ' Arts ' and ' Sciences ' emerges—and the desperate need for a balance.

Following the usual tendency to create specialists when in doubt, there has

been a strong movement, inside and outside the Navy, to turn leadership into a specialization—which could be most dangerous. What is really needed, it is contended here, is to set education in a framework of man in society and to relate all subjects to this in a reasonable, balanced form.

Failing this fundamental educational reform and faced with evidence that all has not been well with naval leadership, the naval movements for reform have been to try and find new expressions for old practices. Thus ' Outward Bound ' or ' Expedition Training ' has been introduced, somewhat artificially, to replace the old intimate concern and relationships between the divisional officer and his men which have been so seriously undermined and diminished by the complexities of the modern naval society, technically and sociologically.

Originally introduced in H.M.S. *Condor*, for air artificer apprentices, expedition training has now been developed at Manadon, and is being introduced at *Fisgard*, *Caledonia*, Dartmouth and other training establishments. It is most noticeable and not, it is believed, merely accidental, that this appreciation and effort has stemmed largely from the Engineering Branch. Engineer officers, by the very nature of their work, have always had a more intimate relationship with their men and a commonly understood basis of professional or technical concern, trust and respect, than has been possible for executive officers and seamen whose duties necessarily entail much ceremonial, and for whom the common bond of seamanship is not at all easily felt or expressed in modern conditions.

The present reformation in the attitude to leadership attempts to reinstate the whole man as the focus—again following the true spirit of the 1944 Act ; officers, as leaders, inherit responsibility for the ' spiritual, moral, mental and physical development ' of their men from the teachers and parents who have hitherto discharged, or neglected, these duties. If, as has been postulated earlier on, there is a two-way obligation between individual men and the Navy, then the latter has to find expression through the officers in a form of dedication to their men's well-being (in the ' whole ' definition given above).

Properly to interpret this full concept of leadership requires very much more understanding and knowledge of Man and men and, somehow or other, room will have to be made at least for some basic education in biology, social history, psychology, etc. After all, if one considers that the naval officer expresses himself, in peace-time, predominantly in training and in human relations, it should not be too much to expect him to be at least as well equipped for this task in basic theory as a social worker, personnel officer or teacher. The Services have nothing to be ashamed of in the actual practical foundations of their leadership institutions, and modern industry is coming more and more to the adoption of ' military ' principles of management. The Navy has been at the game of leadership for some 1,000 years, whereas Industry has only been in it for 200. But ' institutions ' become accepted or taken for granted and lose their purpose when the principles underlying them are forgotten or misunderstood. It is suggested here that the requirement now is for these principles to be taught, in terms of modern definitions and applications; only in this way can the smaller, particular, naval society keep its balance within the larger, general, national society.

POSSIBLE FUTURE TRENDS

Finally, in this context, a scientific method of thought is as much required for human affairs as for material, with the limitations outlined at the beginning of this paper ; but though some may be given this implicitly, or (rarely) explicitly, in their education or training, it is not (to the writer's knowledge) any-

where taught in naval education—except for those who go through the Staff Course. It would seem that the time has come for the B.R.N.C., Dartmouth, with its change of status from secondary school to university, to teach on these lines. Similarly, if something on these lines were introduced into the artificer apprentice training syllabus considerable benefit could be obtained.

From this purely personal survey a few opinions are offered on 'the shape of things to come' :—

(i) The Navy, accepting products of national education, is a 'major user' and can be a powerful critic of this education if it so wishes. It may well have to be, for both scientific, basic education and leadership.

(ii) International comparisons of the educational effort to produce technologists and technicians has shown that, nationally, this country is critically lagging behind U.S.A. and U.S.S.R. Much the same conditions prevail as 100 years ago, at the time of the Great Exhibition. The Navy's own training should be seen as part of the national effort ; this should put the R.N.C., Greenwich, and the R.N.E.C., Manadon, in a new relationship to the nation and could well lead to some form of degree-conferring status.

(iii) Fundamentally, there is critical need to recast secondary education to produce leaders for modern technological conditions by effecting a balance between 'Arts' and 'Science' within a reference frame of Man.

(iv) For organization generally, function (from the job upward) will provide the basis for new institutions to replace the traditional pattern devolved from the top.

(v) Job Analysis, Work Study, etc., will be essential tools for this reformation—if it is to be effective.

(vi) Branch structure, pay, education and training can only be reviewed, with meaning, by the use of such tools for fact-finding : all are inter-related.

(vii) The relationship of man to material will be a critical point of all policy, affecting design of material, education, training and human relations. Properly to allow the integration of these considerations, it would seem essential that education and training (which has bearing upon design) should be given more weight in Admiralty organization and administration.

(viii) The dilemma between the individual and the majority will become more and more acute especially as leadership, or management, tends to become more and more a 'specialization'—nationally and navally.

(ix) This tendency to regard leadership or management as a specialization will heighten the fundamental struggle between professional or technical people and administrative or executive classes.

(x) Much will therefore depend on how people choose their reference frames for thought and decision. In the Navy, the branch or department view-point must be discarded and the forward-thinking will begin to adopt more inter-service and supra-national points of view. Faith and loyalty will be essential and require constant refreshment.

(xi) Above all, during a period of evolution and reform affecting individuals and groups, inside and outside the Service, it will be of the greatest importance to have patience, tolerance, and appreciation of other people's points of view—and to seek the truth, objectively, for the good of the Navy and the Nation.