SYSTEMATIC MACHINERY AND EQUIPMENT SELECTION

A PROGRESS REPORT

BY

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Introduction

SYMES is six years old. This article examines the health of the child. The SYMES policy was conceived in 1966. Its embryo stage of development was described by Admiral (then Captain) Le Bailly in Vol. 16, No. 2, of this *Journal*. Earlier, in Vol. 16, No. 1, an article titled 'Systems Analysis' by the same author and by Admiral (then Captain) Malim mentioned a 'Systematic Machinery Selection Concept'.

The gestation period of SYMES has proved similar to the elephant's—long, complicated and fairly heavy going. The mother-to-be, tended by a large number of doctors and consultants (none of them specialists, incidentally), was a capricious patient, full of whims and fancies. Most whims and many fancies have now disappeared or settled into their true perspective. An increasing amount of SYMES data in the form of SYMES dossiers is beginning to appear in reply to awakening demand.

This article is a doctor's bulletin for the benefit of those not closely involved in SYMES but who may be interested in the patient's progress.

Why SYMES?

SYMES is about conservation—a popular subject. In particular it is about conservation of resources which, in the Royal Navy, means ships, men, and money. These are scarce and sure to become more so.

SYMES is about cost-effectiveness. Despite all efforts to stop them, costs keep rising and so we must make sure that the Service gets the best value for its money. Upkeep and operating costs form a startlingly large proportion of the total life-costs of an equipment.

What has happened to the SYMES Policy?

The aim has remained unaltered since conception. Briefly, it is to 'establish a policy which will govern the future selection of much of the machinery for the Fleet in the light of the financial, industrial, and manpower resources likely to be available, and in the light of the prevailing strategy'. This is a statement loaded with implication and deserves more than a cursory glance before passing on to the more practical aspects of SYMES.

Opinions differ on whether there is a need for any special SYMES. Whichever is right, SYMES has provided a stimulus in the right direction and has probably accelerated a naturally sluggish movement.

Anti-SYMES extremists believe that the existing shortage of money with which to design, build, and fit out ships is alone sufficient to restrain the growth in the variety of equipments. Certainly financial constraint works fairly effectively for very expensive equipments, such as gas turbines, but, like most negative solutions to a problem, it cannot be guaranteed to work consistently.

SYMES is a positive policy to guide and assist selection along disciplined, well-proven lines. In this respect, it is not new but is a compound of well-substantiated common sense and experience. Those who pioneered SYMES

chose their target well. However, seeing the target is only part of the problem: hitting it under adverse conditions is much more difficult.

A Closer Look at the SYMES Policy

The policy is intended to derive a minimum range of equipments to enable the Staff Requirements to be met without severe penalty. In other words, we must pre-select a sound but small range of machinery from which the designer will be reasonably happy to be persuaded to choose items which enable him to complete his design. But how many items form a 'small range' and what is 'reasonably happy'?

Some aspects of SYMES have been loosened and others tightened as experience built up. Many ranges are still not correctly adjusted. One early stipulation was that each range should contain three items. This is unrealistic. At one extreme, where an equipment may reasonably be fitted in large multiples (e.g. filters), a severely curtailed range—perhaps only one variety—is sufficient. Alternatively, to avoid a ridiculous multiplicity of installed units, a range of up to nine equipments may be needed. If a range grows to more than nine units, the category probably covers too wide a field and should be split.

Problems

No new policy with implications such as SYMES is without teething troubles. However, SYMES seems to have had more than its fair share. This may be a measure of the need for such a policy. The toughest and most persistent problem has been in convincing the sceptics. SYMES is analagous to a medicine which is unpleasant to take but totally efficacious if correctly administered in the right dosage. These properties are usually directly proportional to each other.

SYMES is restrictive. It imposes limitations on a designer in his choice of equipments for his ship. If perfect, SYMES should offer the precise equipments which the designer should, with only his precise requirements in mind, choose. If SYMES has done its job well, he will be satisfied: if the selection offered is poor and inadequately matches his requirements, he will naturally tend to resent not being allowed a free choice. As compensation, SYMES offers the designer a placatory carrot in the form of a compromise offset by the use of well-proven reliable equipment backed up by a SYMES Dossier.

The dossier is a neat, comprehensive, and, we hope, attractive package containing practically all the information a designer should need to incorporate an equipment in a ship layout. It also provides most of the information needed to cater for its support. One cover encloses a distillate of knowledge condensed from a huge reservoir of data which is otherwise superfluous and irrelevant.

The dossier contains design information, performance data, scale drawings, and maintenance envelopes. It displays tables, graphs, and drawings. Simple tracings to various scales which the draughtsman can superimpose and manoeuvre on his sketch design are an unusual advantage. His drawing board is not cluttered with large, precariously balanced books waiting for a nudge to send them to the floor. The idea will be developed by using microfilm with various projection and presentation techniques.

Thus the aim is to relieve the designer of the tedious search for data. But somebody must do it; and more efficiently. Centralized data acquisition is more efficient but, because the data is for more widespread use, the probability of its accuracy must be improved. Ensuring that a SYMES dossier is accurate and effectively presented is expensive. Much is demanded from the Ship Department specialist sections whose resources are limited. This is one of the reasons why only a few SYMES dossiers have been available so far. But the situation is improving.

There are nearly 400 equipments in the SYMES range. They vary in size and

importance from SYMES Index Number (SIN) 1.1.1.1. (Olympus Gas Turbine) to SIN 3.7.7.1. (Hand-operated Laundry Marking Machine). Obviously the need for dossiers for some equipments is more pressing than for others. About 100 dossiers are being compiled at present. Fourteen have been published and are already proving their worth, some in uses for which they were not intended.

Misunderstandings

Since its adoption in 1966, SYMES has often been misunderstood. As a result, it has been unfairly criticized. I hope this article will clear up some of these misunderstandings.

Reconsider the overall situation with regard to SYMES. The Royal Navy's share of a limited defence budget has, more than ever, made it essential to reduce costs to a minimum. The standardization which the SYMES policy entails aims to reduce the costs of design and development, logistic support, maintenance and training. Such a fundamental and comprehensive policy must incur penalties if carried out effectively.

Until the appearance of SYMES Dossiers, virtually the only manifestation of SYMES policy outside the Ship Department has been the SYMES Index, TP 1113. The Index is a list of equipments selected under SYMES procedures as being those most likely to meet all future requirements. It is classified 'Commercial-in-Confidence' and is only available outside the Ministry of Defence, on a 'need-to-know' basis, to shipbuilders and other organizations having design responsibilities.

A recurring misapprehension is that the Index is a list of preferred manufacturers. Some shipbuilders seem to think that a manufacturer whose products are not listed in the Index is thereby stigmatized as being unacceptable, as a manufacturer, to the M.O.D. Some manufacturers wish their products to be listed to show that they do meet Naval standards. Both views show a basic misunderstanding of the SYMES policy.

The first three columns of the Index refer to the projected application of the equipment. The equipment selected for the application is identified in the succeeding columns by the manufacturer's name, model or type number, etc. If the forecast requirement is correct, the application is unlikely to change. The equipment chosen to fill it, however, will be reviewed periodically and may be changed at any time when the balance of all the factors involved shows a change to be worthwhile.

No equipment can be included in the SYMES range merely at the request of a manufacturer. There must be a requirement for it in the range and normally it must be selected in competition with other similar equipments. The equipment chosen will be that which it is thought best meets the particular requirements of the Navy.

Inevitably, in any process of standardization, many perfectly satisfactory equipments must be excluded. The absence of a manufacturer's name from the SYMES Index certainly does not mean, therefore, that he has failed to meet the standards of the Ministry of Defence.

Life Cycle Costing

The most realistic basis for a systematic selection philosophy with aims similar to SYMES is Life Cycle Cost (LCC). Other factors being satisfied, the remaining factor at the root of selection is the overall cost of an equipment, i.e. the cost, starting with procurement, through installation, upkeep, operation, depreciation and eventually to its scrap value which is a negative cost. It is even necessary to look far ahead beyond the equipment under examination to its own eventual replacement.

As with many other management techniques, the principle of LCC is indisputable. Selection based mainly on practical feed-back creates a vicious circle which can only be broken by speculation. Speculation, however judicious, admits an even chance of failure. SYMES cannot justify such a chance and requires much shorter odds. At present we have neither the means nor the capability to carry out realistic LCC assessments of equipment in isolation: there is a disheartening dearth of accessible data which makes the process impracticable.

For SYMES, a promising and realistic approach to LCC is a comparative one. Despite not knowing the actual value of many factors which we wish to consider when selecting an equipment, a simple value rating can be assessed. By superimposing an importance factor on each value rating, the resultant ratings added together give an overall comparable value rating. After doing these assessments on other similar contenders for a place in the SYMES range, a comparative estimate of which best suits the Naval purse can be made. This method is simple, inexpensive, and reasonably accurate.

The Future

To return to the original analogy of the baby elephant, SYMES has reached the end of a protracted gestation. It has had to come to terms with a harsh environment inhabited by a critical population which regards the infant with suspicion. In the highly-biassed view of its present guardians, the child is a paragon. Understandably, however, the other inhabitants of the jungle have yet to be convinced of the advantage of this awkward and intrusive youngster growing up in their midst.

SYMES demands four basic qualities from those who expect to gain by it: faith, vigilance, precision, and common sense. They must have faith in its purpose, maintain vigilance over its principles, exercise the utmost precision in its application and, most important, use common sense liberally in its interpretation.