

# WHAT IS S.M.A. DOING?

BY

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*(Ship Maintenance Authority)*

## **Introduction**

Readers of some doubtlessly well intentioned recent literary efforts to put the maintenance world to rights have perhaps been left with the impression that the Ship Maintenance Authority is some sort of geriatric institution whose inmates while away unhurried days browsing nostalgically through vast accumulations of yellowing S2000 Series reports, whilst remaining quite indifferent to the needs of those who go down to the sea in ships.

Well, what do they do?

The following is intended not so much to convert the cynics on points of detail, but rather to show how a maintenance planning system is provided and refined to assist ships staffs and others concerned with the business of keeping ships seaborne, mobile and capable of performing effectively as fighting units. In addition, a procedure is offered whereby material shortcomings and design deficiencies which become apparent during the course of a ship's life may be made good. Finally, reference is made to an increasing SMA involvement in the provision of empirical data for forward design studies, supplying objective

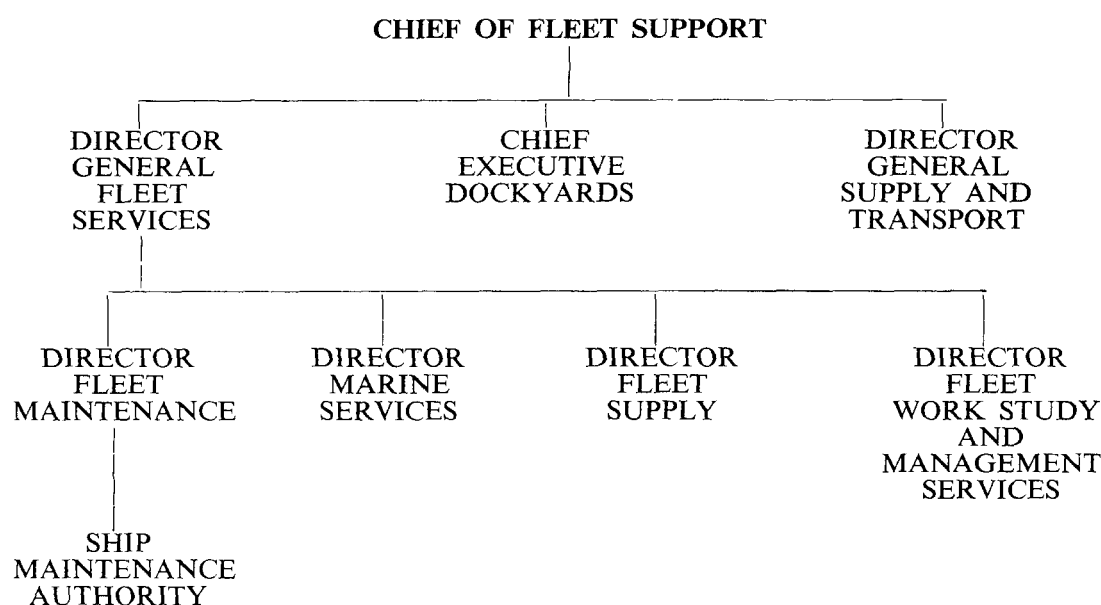


FIG. 1

ship information to MOD (Navy) and Fleet Commanders, and pioneering techniques to improve ship support services.

### Background

A few words about historical background might help to set the scene. The idea of maintenance planning is not a new one. In the days of reciprocating steam machinery, d.c. dynamos, Evershed transmissions, etc., marine and electrical engineer officers had their routines for getting round their equipments, subject to the palliatives and remedies scattered through the pages of the various BRs. But it was not until the mid-fifties that such an approach was formalized, when the Admiralty Standard Documentation System came into use in certain ships 'adopted' by Class Authorities. For surface ships these Class Authorities were based at the three home ports, responsible to the Administrative Authorities there, and loosely linked by an Admiralty Class Authority Co-ordinating Committee.

Each Class Authority specialized in a number of classes of ships, e.g., Portsmouth was responsible for installing the system in capital ships, cruisers and carriers. Contemporary accounts suggest that this early arrangement worked reasonably well despite the occasional clash over three different approaches to the maintenance of an equipment common to all ships. A contributory factor may have been the close liaison which was possible between ships and their parent Class Authority, which was more often than not local to them when in port.

Unfortunately, this happy feeling of togetherness did not always extend to the Class Authorities themselves, each of which was steering its own maintenance course often divergent from the others. The disappearance of the NORE Command as such in 1961 resulted in the amalgamation of the Chatham Class Authority with Portsmouth, to be joined shortly afterwards by their West Country brethren. In 1963 the Class Authorities were united and became the Ship Maintenance Authority, responsible to the Director General of Dockyards and Maintenance at Bath. Changes at Headquarters in 1969 brought a further change in the organizational relationship with the SMA and FIG. 1 shows the position as it is now. It can be seen that the SMA functions as an outpost of the Ministry of Defence, and is the front office for the Director of Fleet Maintenance.

## Tasks

The ideal of all naval engineering maintenance support is to achieve a material state where an equipment, system or ship will be capable of performing its specified function or role when required to do so. Planned Maintenance should subscribe to this and include preventive maintenance to minimize the likelihood of defects and contingency plans for corrective measures when they do occur. Both approaches are difficult to forecast with absolute confidence, so change in the wake of experience must be expected.

## Documentation Department

The SMA Documentation Department has as its prime task the installation of the E2 system in new ships as an aid to maintenance management. Before this can be done, lists must be compiled by the SMA Equipment Departments using the Systems and Equipment Lists obtained from the shipbuilders and Weapon Fit Lists from the MOD. Ship visits add to this information. The result is the completion of the Ship Equipment Lists which form an index for maintenance schedules. This information also included on the S2024 Series forms to assist ship staffs when making up their master records. (Following a Work Study report which highlighted some duplication in these documents, a trial to rationalize them is now going on in two *Leander* Class ships.)

The installation team will finally visit the ship shortly before acceptance, to deliver the complete E2 package, set up the plan for the first four-monthly period, and advise the senior ratings on the running of the system and procedures for updating it.

This brings us to the knotty business of amendments. There are at present 2400 separate schedules and this number is continually increasing as new equipments come into service. Some of course are going out as equipments become obsolete, but even here there is a tendency for the schedules to linger on for use in a few older ships. The bulk of the schedules is well established, however, and one would think, well beyond the need for further amendment. Unfortunately, the feedback from sea in the past has been disappointing, and what criticisms have been made have more often than not included proposals which increased the maintenance load rather than reduced it.

Most of the schedules were drafted originally in consultation with the Design Authorities who, wisely, perhaps, tended to err on the side of caution. Furthermore, their statements were often built on the manufacturers' recommendations made from a works situation quite different from a seagoing environment. So it was to be expected that the eventual maintainer would have improvements to suggest in the light of his experience on the job, and that these improvements would tend to refine and reduce his work. The message here is that if a seagoer does find that the maintenance is unnecessary or unrealistic he should say so, for the sake of his ship and the rest of the Fleet. The means of doing this is Form S2021. This applies also to the much neglected servicing plans. If equipment does work satisfactorily despite an allegedly weekly routine being applied only once a month, or not at all, then a little of that saved time should be used to raise a Form S2021, so that the conscience of everyone else may also be salved by an official declaration of the reduced requirement.

## Equipment Departments

The comparative absence of external proposals prompted the SMA Equipment Sections to look inwards for indications of areas where maintenance could be improved. Evidence was to be found in defect lists, OPDEF signals, S2022s and even the humble job cards. Analysis of the latter proved to be especially fruitful. This is not surprising really when it is realized that a job card is a

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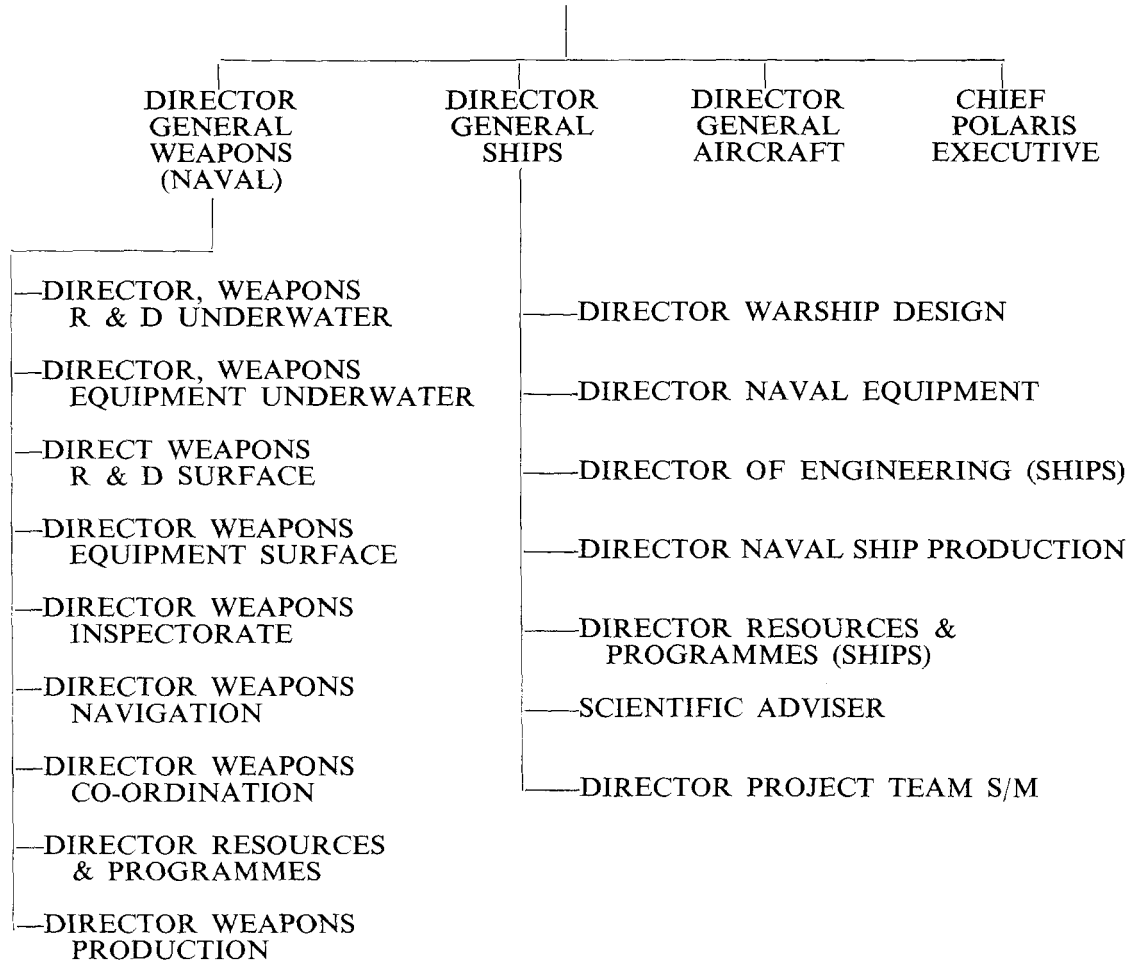


FIG. 2

report on an item of corrective maintenance, and a means of reporting which, if intelligently and fully used, can be a first-hand factual record of the defect description, equipment running hours, man-hours and skill levels involved. The number of job cards received in a year runs into nearly six figures, an amount which requires the aid of a computer to sift and sort. The print-outs can show items which are claiming a disproportionate share of corrective attention and where the application of preventive maintenance should be critically examined.

The process of critical examination has been supplemented by the activities of the Naval Manpower Utilization Unit. The setting up of a systematic management trial in four *Leanders* focused attention on the maintenance schedules in use in those ships and produced a substantial number of S2021 reports from the NMUU. Most of these proposals have been accepted and are being included in the amendments for general issue to all ships. It is well appreciated in the Ship Maintenance Authority that amending planned maintenance schedules can be a tedious chore for ships staffs. It is important therefore that all proposals and approaches are brought together before official amendment instructions are distributed. This co-ordination can sometimes lead to apparent delay, especially if Dockyard or Design Authority approval is required, but this is considered to be preferable to taking immediate action on single proposals, perhaps of a minor nature, which might be expanded soon afterwards by additional findings. Maintenance changes concerning the safety of personnel or situations where operational effectiveness would otherwise be seriously affected, are of course given urgent treatment.

Now a paragraph or two on S2022 reports. The quantity and quality of these have always provided most useful means for correcting the persistent material shortcomings which can depress equipment reliability, availability and maintainers' morale. A fair proportion of these reports are dealt with by the Equipment Sections without further formal reference to other authorities, and this does not mean 'filed in SMA awaiting further reports'. Information on As and As, modifications and part numbers is available together with a substantial bank of experience, and a telephone call to a drawing office or design department can add to this for a quick single S2022a or SM23 reply.

A report with insufficient substance in itself to merit outside action may be filed to await support from work-up reports, job cards, and other S2022s. Alternatively a questionnaire may be sent out to other ships to determine the extent of the problem. When a case has been substantiated it is presented to the appropriate Design Authority for investigation and remedial action. The Design Authorities who are concerned mainly with ships are the Director-General Ships and Director-General Weapons. An outline of their structure is shown in FIG. 2. Like all MOD departments their resources, financial and manpower, are not unlimited and allocation of these resources for post design work is dependent on a convincing case being made for such attention. Investigation often requires discussion and correspondence with manufacturers, which can become prolonged.

It is then up to SMA to keep track by regular 'bring up' enquiries and reinforcement of the situation with further reports as they come in. A neat way of achieving this is by Equipment Review, which is a collective presentation of all outstanding and new reports followed by regular appraisal meetings of interested parties to review progress and agree on future action. The eventual result of these deliberations may be promulgated by MOD letter, A and A, or modification instruction, but most decisions are communicated to the Fleet by SMA through S2022a defect acquaints.

### **Information Department**

A large amount of information is sent into the SMA as a matter of routine, as those who raise S2040, S2060s and so on know only too well. These returns make up the data bank on which the Information Sections draw to produce their assessments of material state and ship availability. The department has three specialist sections: one does computer work for internal use in the SMA, the second carries out statistical studies for Fleet Commanders and MOD(N), and the other is producing a mathematical model to be used for predicting the effect on ship performance of variations in the availability of systems and equipments. The studies provide a measure of ship activity and usage and identify those ships which have received less than their specified upkeep time or have exceeded the normal limits of usage and availability. They also give a picture of ships with abnormal preventive maintenance and defect backlogs and an indication of the effectiveness of Assisted Maintenance Periods.

In recent months a small number of running logs have been placed in ships as a trial to obtain more accurate data on the performance of selected equipments. Analysis of these logs is providing 'mean time between failures and 'mean time to repair' figures for calculating reliability, maintainability and availability in real terms. This sort of information is being increasingly sought by design departments to ensure that the coming generations of ship systems will have a greater degree of built-in reliability. These early results have been most encouraging and investigations are now extending into further use of this data to determine failure distributions as a basis on which to forecast equipment behaviour. This could be a significant pointer towards a better determination of an optimum preventive maintenance package.

## Project Sections

This article so far has been devoted mainly to the E2 system and actions arising therefrom. Further details can be found in the pages of BR 1313, *Ship Upkeep Manual*, which is a 'must' for every ship's technical office. But there are aspects of the SMA task which are not so mundane. Each of the departments mentioned above has a section whose concern is the exploration and validation of new methods and techniques. The indeterminate time variable associated with the drafting, revision and finalizing of maintenance schedules showed there was a need for them to be more factual in the first place. For some time now the SMA has been working with the Admiralty Marine Engineering Establishment on maintenance evaluations of new equipments before they come into service. These ensure that maintenance instructions can be implemented, i.e., the job is a practical proposition. These exercises have been developed to show in addition what tools and spares are required to support the operation, what the actual work content is and what level of skill should be employed. This information can be written into job information cards to supplement the schedule. Most of the evaluations to date have been in the field of marine engineering. Last year, however, a team of three was detached to work at Rolls-Royce on behalf of DG Ships to draft and validate the schedules for the propulsion modules for the Type 42 Destroyer and this team included an ordnance electrical mechanician for the control module. The team is already producing very worthwhile results, and negotiations are taking place to start similar activities with trials of weapon systems and SYMES range electrical equipments.

Non-destructive testing is another technique which is receiving much attention, with emphasis on Vibration Analysis as a diagnostic aid. After trials by SMA in a number of ships, the Western Fleet Technical Staff are now starting to feature vibration analysis in their pre-refit inspections. Infra-red monitoring has also been tried to identify high resistance connections in heavy current electrical machinery but results here were disappointing.

Two projects which are occupying time in the Weapons and Electrical Department are the formulation of a recall code to facilitate defect data retrieval and liaison with two DLGs who are setting up a quality assurance scheme to assist refit progress. This is expected to help rationalise the 'B' sections of the PM schedules, which have often been topics for much controversy at refit conferences.

Finally mention should be made of work which is going on to improve the presentation of the schedules themselves. Those for new classes of ships now being laid down will be system-orientated and are expected to show the complete maintenance requirement spanning all departmental specializations. The format too will simplify the amendment problem by separating the 'what to do' part of the text from the 'when', but it is hoped that by then the problem will have already been solved or at least reduced by full evaluation and validation at the draft stage of the schedule.

## The Way Ahead?

DCIs 305/67 and 1144/69 herald the advent of the Ship Upkeep Information System which will be with us in the mid-seventies. Work is already well advanced on defining SUIS requirements and reporting levels.

A critic of the Admiralty Documentation System serving afloat wrote in 1963 that 'Planned maintenance is a rewarding system providing we remain aware of the fundamentals and keep the bureaucrats at bay'. However, it surely would not be denied that the effective management and working of today's costly ships does demand a sophisticated shore support and information service.

If another quote may be forgiven, perhaps the last words may be in those

spoken by a Chief Staff Officer (Technical) of the Home Fleet when he said: 'In material, as in other respects, the efficiency of the Fleet must depend upon the skill, determination and initiative of the officers and men in ships. Our purpose is not to attempt to provide a substitute for this, for there is none; it is to create conditions in which these essential qualities can flourish.'

*Acknowledgement* is due Lieutenant-Commander A. J. F. Tucker, R.N., and his team for the contribution on their work in the Information Dept. of S.M.A.