

# TECHNICAL HANDBOOKS FOR THE ROYAL NAVY

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*About 300 Contractors' technical authors are now working on handbooks for Weapons and Radio, and Ship Propulsion equipments and systems. Their activities are supervised by five author/editor groups—three in the Weapons Department and two in the Ship Department.*

## **The Need for Handbooks**

The Armed Forces must be among the biggest users of technical publications in the country, and there is little doubt that the Services' requirements strongly influence the publications profession in general. This Paper sets out to highlight some of these requirements and their implications from the naval point of view.

In general, all Service publications have much in common; the Navy, however, has some special problems. The 'fleet train', which provides mobile support for the modern fighting ship, has done much to reduce the ship's dependence on shore bases; even so, the effectiveness of a warship is still dependent on its ability to operate at peak efficiency as a self-contained unit for long periods, under conditions ranging from arctic to tropical. This means a large degree of self-reliance in the maintenance of its armament and propulsion equipment under varying conditions. With this in mind let us examine the essential features of a naval technical handbook.

It is well to start by defining the technical handbook in its relation to the mass of documentation which surrounds an equipment from its inception. This documentation has its roots in the research and development phase where the purpose and parameters of a new equipment are laid down. Then follow the design appraisals, theoretical and applied research notes written by and for the scientists and designers, couched in language far removed from the requirements of a handbook; drawings begin to appear, but only in rough form; specifications are drafted; costing exercises are carried out and trials of equipment are staged to prove the theories. During this phase the accumulation of information is rapid but not well recorded, reliance being placed on the know-how existing in the design teams. Nevertheless, this is the hunting ground of the technical author who at a later date, and perhaps when many of the project workers have dispersed, must sift out the information necessary for the handbook. This information may be said to have a two-fold purpose—to maintain the equipment, and to train personnel.

The handbook must take account of the reader's basic knowledge acquired through formal trade training and practical experience on similar equipment. If this is not properly assessed, the technical author will have difficulty in translating the designer's ideas into meaningful information. Naval handbooks are generally written for a range of personnel of varying skills and responsibilities. The author should know the minimum skill which he can assume in his readers; for maintenance, this is usually the naval artificer level, roughly equivalent to the civilian tradesman with an O.N.C. in industry.

### **Maintenance**

Maintenance is the handbook's major function—maintenance in the fullest sense, covering all aspects of operating, servicing, upkeep and overhaul. Automation is the keynote of the modern warship—with its armament controlled by computers, and its propulsion equipment by electrical and mechanical remote and automatic control devices. The old term 'reliability' now takes on a new urgency and becomes 'availability', and designers are set the task of producing equipment which will operate virtually non-stop. Problems of space are now so acute that it is not always possible to 'double-up' vital equipments to provide a stand-by in case of failure. Self-monitoring and module replacement techniques are being exploited but every attempt to reduce the human element in operating a ship puts a greater load on the maintainer's shoulders, and increases the importance of, and the need for, handbooks.

No maintainer, however experienced, can be expected to know his equipment 'by heart' and he must be able to fall back on his handbooks for reference. Naval maintenance philosophy is based on periodic checks against a laid-down schedule of tests and inspections. The frequency and depth of these tests depend on the use of the equipment and staff available, i.e. the periodicity can vary from one class of ship to another. The detailed procedures required in these tests and inspections are given in the handbook and, where it is possible, typical figures are quoted. The hope is that any gradual deterioration observed during this checking will forewarn a catastrophic failure, and that the potential

fault will be rectified while the equipment is still serviceable. The term 'preventive maintenance' is used for this philosophy, the object being to avoid completely the 'breakdown maintenance' with which we are only too familiar.

Special-to-type test equipment is frequently employed, and this in itself must be kept in prime condition—hence a further need for handbooks. Much has been done to keep the range of test equipment to a minimum, not only in the Navy but also between the Services. The presentation of testing instructions depends largely on the nature of the equipment. Electrical and electronic maintenance information is based largely on meter readings, oscillograms and stage-by-stage checks, all in association with circuit diagrams. Mechanical equipments require step-by-step stripping or dismantling instructions, measurements (often to four decimal places) of wear of components, and clearances, and checking of lubrication and protective finishes. With increasing use of new types of equipment, there is less support these days for the once-popular fault-finding chart. A good fault-finding chart cannot be compiled until the performance of a type of equipment has been thoroughly evaluated; if it is attempted before the equipment goes into service the result is likely to be a mixture of imaginative crystal gazing and technical platitudes.

Most naval equipment is a blend of mechanical, electrical and electronic engineering and this is recognized by cross-training between specialists. None the less the author must be careful to partition his book so that each specialization has its clearly defined responsibilities. Setting-up instructions must be clear and precise and there is much to be said in favour of presenting them as drill sequences. Whatever method is adopted the key to a successful maintenance handbook is information accessibility; in times of action it could be vital.

### **Training**

In its training role the handbook is used extensively in the specialist schools; occasionally it has to serve instead of a formal course on the equipment, and this is where the 'technical description' is so important. Criticism is sometimes levelled at the extent of the descriptive passages in handbooks, and it is true that they may be read in detail only on initial acquaintance with the equipment. It is little comfort, however, to the user searching for the solution to a tricky problem arising in the middle of the Indian Ocean to read that '... the operation of the device is well-known and need not be described here'. The handbook is not intended to be a training textbook, and must avoid overlapping topics covered in training curricula. Inevitably when writing about new equipments, novel techniques arise and these must be explained; theoretical dissertations are best inserted as appendices but even when copious designer's notes are at hand, the author should resist the temptation to 'blind with science'. Drafts of naval handbooks are usually sent to the training establishments for vetting and criticism and where practicable 'trying on the dog'. A book can usually be relied upon if it withstands the scrutiny of the instructors and trainees about to become responsible for the equipment.

In passing it is worth mentioning the excellent range of Service textbooks which are available to the public via Her Majesty's Stationery Office. Good value in themselves, they are a guide to the standards of technical education in the Services, and in this respect are essential to authors writing for Service Departments.

### **Timing of Production**

Almost as important as the contents of the handbook is the timing of its production. Written while the equipment is being designed and developed, the information it contains is vital to the user when the equipment first goes

into service. The number of design changes and modifications is usually such that it is impossible to publish a fully up-to-date handbook in time to meet the needs of the first users; it is then necessary to publish preliminary or advance information. It is most important that the author should have the time factor constantly in mind.

### **Navy Department Organization**

The Weapons Department and the Ship Department are the two main organizations sponsoring handbooks. Despite the popular belief that no one Government Department knows what the other is doing, even within the same Ministry, there is close accord between our two Departments; points of difference in our specifications largely arise out of special circumstances. The trend throughout is to get a unified presentation of information embracing the whole ship—major systems, equipments and components. Much of the work is done by contract, and there are a number of bureaucratic procedures which a book has to go through during its checking and publication which, frankly, we just have to suffer. The books are published as official documents and there are procedures, often ponderous, which go with this. It can be fairly said that a reasonable degree of understanding of each other's difficulties has been built up in recent years between contractors and ourselves.

### **Quality of Technical Authorship**

The quality of a naval handbook depends entirely on the quality of the technical author preparing and editing it. This is not to say that the quality of illustration is not important—it may even be vital. But the author is the architect of the whole book, and he is responsible for the ideas which the illustrator turns into illustrations. The author-illustrator partnership is a most important one, and we are fortunate in having a good deal of first-class illustrator talent and experience to draw upon. Unfortunately the same cannot be said for authorship; it is no secret that the number of really good technical authors available today is still far too limited. Whatever academic qualifications he may require in the various fields of his activity, the technical author is the link between designer and user/maintainer, and he must thoroughly understand the technical problems and working conditions of both. He must be capable of extracting, as well as understanding thoroughly, all the information necessary, and presenting it clearly, completely, and without obscurity and ambiguity, in the form his readers need.

It is said that the illustrator adds a third dimension to the designer's drawings in producing perspective and cut-away illustrations. It can also be said that the author adds a fourth dimension—time. He should see the equipment functioning for years ahead and be able, in collaboration with the design authorities, to assess and describe in detail the maintenance necessary to ensure this functioning. This is far removed from the still very prevalent idea of the technical author as a kind of technical ghost or shorthand writer, busily copying out or taking down other people's ideas and opinions. Authors have been known to be described as 'bent engineers'—the bent being for writing.

Arranging for handbooks to be prepared by contract means a constant search for authorship of the right quality. This kind of quality cannot be specified in a contract in the way that the quality of, say, a material can be specified—or if it can, to my knowledge it has yet to be attempted. This is why the search for quality contract authorship is a process of trial and error; happily the number of errors seem to be waning.

It is not possible to give examples of good and bad work in such a short paper as this. It is sufficient to say that technically bad work is just as common

as work which is badly presented, obscure or ambiguous. The search for quality means the search for technical (or technological?) quality as well as for quality of presentation. In fairness it should be said that we do find both—sometimes.

### **The Navy Department Author/Editor's Function**

The idea which used to be held in some quarters that the Navy Department author/editors exist only to carp at or criticize contractors, is almost dead. In his relations with contractors, the author/editor has a difficult function to perform; he is the agent, as it were, for the equipment user and the British taxpayer. He has to see that one gets the best value in handbooks and the other the best value for money. This task is considerably lightened if the contractor's first draft is of really good quality. We all know how much easier it is to re-write a bad draft completely, rather than to touch it up in the hope of improving it; if the author/editor does this, it may please the user but it will not benefit the British taxpayer. Do not think that he does not understand contractors' problems; he knows these to be considerable and he is always available for consultation and advice.

### **Cost**

A word about the cost of handbooks would be appropriate here. For obvious reasons Government contracts must be placed by a tendering system which is seen to be as competitive as possible. The difficulty of specifying authorship quality means that competition must be restricted to those firms which are known to have this quality. The quality authors tend to move from firm to firm, which places us in some difficulty. We try to be as fair as possible in placing our contracts among as many contractors as we can, but the deciding factor must be our knowledge of the contractor's authorship quality. This policy is not intended to promote price-cutting; indeed the shortage of quality authors may well mean that prices have been cut too far already. Value for money must be our criterion. Good quality work will be cheaper to the taxpayer in the end, even if it does cost more initially. The D.S.I.R. Report on Engineering Design (the Feilden Report) comes out strongly in favour of this point.

### **The Future**

During the last two or three years there has been a much greater awareness of the need for improvement in the presentation of technical information in all fields. In the field of technical authorship, this has led to much discussion and considerable advances; the City and Guilds courses, for instance, have done much to raise standards. Much remains to be done if technical authorship is to become the kind of career which will attract and hold the right quality and quantity of entrants; managements, for instance, must be made more aware of the value of really good publications—one might almost say of their existence, in some cases. As equipments become more complex, the demand will be for better, if not bigger, handbooks. This will mean more highly qualified and more technically flexible authors; the tendency to specialize in mechanical or electrical authorship is already disappearing. The successful author of the future must be equally at home in the mechanical, electrical and electronic fields.

The Presentation of Technical Information Group are currently discussing authorship problems as part of the wider field where improvement is needed. The formation of the Institute of Technical Publicity and Publications is a most healthy sign for the future. Full-time technical authorship courses on a regional basis are already being discussed and may be part of the answer. How these will come about, and in particular how their teaching staff will be found, no-one can yet say. Perhaps the Institute will, in the course of time, find the answer.