

STORAGE AND PRESENTATION OF TECHNICAL INFORMATION

BY

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Introduction

The preceding article on Management of Support Information in Information Technology Year 1982 has set the scene for a general way forward. This article concentrates on Information Technology applied to the conveyance of Support Information documents and publications to the Fleet by visual medium.

Information Storage

Information can be 'stored' in either hard copy (i.e. on paper or polyester film), microform, or computer memory. Each has advantages and disadvantages which are briefly discussed below. The chosen method will significantly affect the management of the information so stored, which for the Navy at present relates principally to maintenance and stores.

Given the necessary relatively simple equipment, hard copy and microform are interchangeable but can only be converted into computer storage at considerable expense. A computer data bank, however, can readily be reproduced as hard copy (print-outs) or microform (COMfiche): this includes all documentation other than complex drawings—and rapid progress is now being made in this field. It is tempting to deduce that in the future all information will come from computers, indeed PRESTEL is showing the way, but this would ignore their disadvantages and limitations and the extent of existing investment in hard copy.

Use of Computers

In the context of documentation, a computer can handle enormous quantities of information, manipulate data at will, and reproduce it with unerring accuracy. The information can be viewed on a video display, or printed as hard copy or COMfiche. Present users are hampered by lack of on-line video terminals and the relative clumsiness of print-outs: in a warship, a computer store would be vulnerable to several external influences, and reliance on radio links with storage ashore impracticable. In other words, the necessary technology is not yet sufficiently developed for direct application of this method to R.N. ships.

Use of Microform

On the other hand microform, which is less dependent on external resources, is generally acceptable provided that the necessary equipment and indexing are available and that hard copy can be obtained for some particular purposes. The publication of most support information on microform accompanied by generous provision of readers and reader/printers has the following important advantages:

- (a) Elimination of the physical bulk of documentation.
- (b) Virtual elimination of the need for amendment by the user.

- (c) Provision of means for rapid updating and easier indexing and retrieval.
- (d) Substantially lower cost than printing and distribution of hard copy.

Use of Hard Copy

Despite the expense and drawbacks of using hard copy, there will always be a requirement for some information in this form, such as coloured drawings or system diagrams, the need to browse, to annotate, or simply take them into the bilges. Whatever the system therefore, adequate provision must be made for production of essential hard copy, preferably by the user himself.

Application to the Fleet

Thus it is clear that the most sensible option for the Fleet in the eighties is a system based on microform with retention of hard copy for certain applications, while pursuing the possibility of a further move towards computer storage as the available technology advances.

A Brief Guide to Microform

Micrographics as a technique goes back to the beginning of the century and has been in common use for thirty years. Rapid advances in materials and machines developed during the sixties and seventies mean that today a very wide selection of relatively cheap and very efficient equipment is commercially available. Use of the technique has expanded rapidly from specialized requirements, local storage, and archives to widespread applications, e.g. in libraries, publishing, and stock control—even recipes are available to American housewives on microfiche! Ease of storage, access, distribution, and retrieval, irrespective of economic factors, are dictating that use of the medium continues to expand as a partial answer to problems created by the information explosion.

Microform

Microfilm is available in a wide variety of shapes and sizes, in roll and in sheet form, which collectively are known as microforms—microfilm strictly relates to roll film. Different formats have been developed to suit the many applications, the principal divisions being 16 mm or 35 mm microfilm and flat microfiche cut from 105 mm film.

Microfilm

Most early systems were based on 16 mm or 35 mm roll film, and these are still widely used for some applications, the film usually being loaded into cartridges or cassettes. However, roll film is not as convenient as the flat microfiche for indexing, retrieval, ease of duplication, or amendment, and is being phased out of R.N. use.

One continuing application for 35 mm film is the reproduction of large drawings which cannot sensibly be further reduced. In this format, a single frame is mounted in an aperture card, a configuration compatible with automatic filing and retrieval systems and well established in most drawing offices and in ships and submarines carrying datum packs.

Microfiche

Various schemes are available for creating a flat film with many images, such as sandwiching strips of 16 mm film in plastic envelopes, but the most satisfactory technique is to film a number of images in a matrix layout on a sheet 148 × 105 mm (A6 size). This is known as microfiche; it is convenient to handle and stow, provides the easiest format for indexing and retrieval, and is well established and cheap. It is the 'preferred format' for use in naval handbook applications.



FIG. 1—PART OF THE N.S. CATALOGUE—HARD COPY VERSUS MICROFORM

Reduction ratios used commercially are usually between $18\times$ and $48\times$ giving from 60 to 420 A4 images per fiche, although one version known as ultrafiche can carry 3000 images at $150\times$ reduction. The standard chosen for naval use is $24\times$ which provides 98 A4 pages per fiche enabling the average handbook to be reproduced on one piece of film.

Microfiche are produced photographically, using an automated camera which sets each frame of the matrix in sequence. A separate camera is usually incorporated to provide an 'eye-legible' title area.

Computer Output Microfilm

Computer Output Microfilm, or COM as it is generally known, has been in use in the U.K. for no more than fifteen years but is now widely exploited, for example in production of the Naval Stores Catalogue. The process converts output from a digital computer to microform in a single operation with no intermediate paper print-out.

COM recorders take several forms but the majority work on the principle of information from the computer being transferred, via a magnetic tape, to the COM recorder. The recorder produces an image on a screen which is then photographed automatically frame by frame. This operation is controlled by a micro computer which can also command the introduction of eye-legible titles and computer-generated indexes.

The COMfiche specified for naval use is of standard microfiche size, with a preferred reduction ratio of $48\times$ giving 270 computer landscape images in eighteen columns and fifteen rows.

Standard Formats

The standard or 'preferred' formats are thus:

35 mm aperture card—	Engineering drawings
98-frame microfiche—	Handbooks
270-frame COMfiche—	Indexes and catalogues

Storage and Retrieval Systems

Microform can be stored in any standard card-index system or in fiche binders. The latter, which are commonly used in the Service, comprise panels of pockets which hold the fiche vertically disposed with their titles visible. A standard four-ring binder will hold more than 200 fiche, the equivalent of 10 metres of shelf space. For shore applications, a number of automated retrieval systems are available which hold aperture cards or fiche ready in suitable containers for instant display in response to requests entered via a keyboard, or direct from a computer.

Readers

Microform readers are used to enlarge the micro-images back to readable size. Three types are in common use—the desk-top which either resembles a TV set or presents a projected image on a light-shielded screen, the portable which usually folds up into a briefcase, and the hand-held with which a single frame may be read with suitable lenses held up to an ambient light source. A fourth option is essentially a film projector, particularly applicable to the classroom. Most readers are capable of projecting images from two of the preferred formats and some from all three. Other available options include the facility for accommodating two fiche or aperture cards, or of displaying two adjacent fiche frames together to form a 'double-page' image. Designs have greatly improved recently and an excellent range of inexpensive equipment is available commercially.

Reader/Printers

On occasions when a paper print is more appropriate to the use of the information displayed, a reader/printer will, at the touch of a button, transfer the image on to hard copy comparable with the output of a photocopier.

Three methods of printing are available. In the dry-silver process, the paper contains silver salts sensitive to light and an image is developed and fixed by passing through hot rollers, resulting in a dry print. In the electrolytic process, the paper contains aluminium foil and zinc oxide, which conducts electrically when exposed to light, charging the surface of the paper: the image is created by electrolysis on passing the paper through a solution of silver nitrate and is delivered semi-dry. In the electrostatic process, electrostatically charged zinc-oxide-coated paper is exposed and the image produced by a liquid toner. All prints are positive but they can be produced from positive or negative film.

A wide selection of reader/printers are available commercially for shore use, but there have been many difficulties in procuring equipment suitable for use at sea. The unreliability of the 1970-standard outfit¹ in a shipborne environment, aggravated by many examples of poor drawing standards, has contributed to widespread undeserved disenchantment with the medium which it is hoped the imminent introduction of purpose-designed or modified replacements will dispel.

Costs

The cost of printing a typical naval handbook in black and white on A4 paper, complete with standard cover and assuming an average run of 125 copies, is £1500. The equivalent cost of producing a master fiche and 125 duplicates is less than £30. The cost of a reader is equivalent to 10 printed books and a reader/printer to about 200. A frigate carries some 3000 printed books, the majority of which could be carried as microfiche with no cost, weight or space penalty.

Navy Department Standing Committee on Microform (NDSCM)

The development of microform techniques for naval purposes, afloat and

ashore, is conducted under the auspices of this committee, which reports to the Director General Fleet Support Policy and Services. Its terms of reference include formulation of Navy Department policy on all aspects of microform, monitoring and co-ordination of the use of microform in the Naval Service, and liaison with the Navy Department Standing Technical Publications Policy Committee on the application of microform to technical publications.

CINCFLEET and CNH interests are represented by DES(N), with representatives being co-opted from time to time to serve on the Shipborne or Shore Equipment working parties.

The Way Ahead

The continued development of the shipborne application of microform will remain essential until more sophisticated and reliable computer techniques are available to enable a major step forward in the management of support information. Accordingly, all ships now hold the Naval Stores Catalogue in COMfiche and a policy has been determined for new technical BRs to be published in microfiche, vide DCI (RN) 249/81. Most ships have by now received an enhanced outfit of readers, vide DCI (RN) 410/80, to enable them to handle these publications. A new A3 reader/printer has been developed specifically for shipborne use and deliveries, initially to new construction vessels, are scheduled to commence early in 1982. The Lynx aircraft onboard documentation outfit is in the process of conversion to microform now. It is NDSCM policy that adequate provision is made ashore for the back-up of Fleet requirements. This includes the recent issue to certain Fleet Maintenance Bases of high quality A2 reader/printers, available also for use by ships' staffs to augment onboard facilities where necessary. Training in the use and, where appropriate, the maintenance of microform equipment is now included in PJT and career courses.

Sequel

Another article entitled 'An Outbreak of Microform' illustrating the range and application of microform equipment available to the Fleet and the Naval Home Command, and describing the development of the new shipborne reader/printer, will be printed in the next issue of this *Journal*.

Acknowledgement

The authors are indebted to Captain J. P. Wrigley, formerly Director of Engineering Support (Naval), for the use of the interim report of the Management of Support Information Project dated October 1980 in the preparation of this article.

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1. This is described in the *Naval Electrical Review*, Vol. 19, No. 3 (Jan. 1966)

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1. BR 3044, *Microform in the Naval Service*.
2. DCI(RN) 410/80: Microform—Introduction of Equipment into Ships and Submarines
3. DCI(RN) 249/81: Microform—Policy for Extended Application to Naval Technical Support Publications.