### ARRB MICROFICHE PRODUCTION AND ARCHIVING AND ITS ROLE IN THE ARRB INFORMATION SYSTEM

by

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Australian Road Research Board 500 Burwood Highway, Vermont South Victoria 3133, Australia September, 1979. Discussion Note DN 263 Final  is to describe the ARRB microfiche archive system and the place it holds in the range of specialised information capture facilities available in and to ARRB for editing, updating, archiving, retrieval and reproduction of textual and diagrammatic material. This report is complementary to Lay (1979), who describes the application of information handling facilities at ARRB to the research and information dissemination task of the Board.

\*Lay (1979). The ARRB Information System. Australian Road Research Board. ARRB Technical Manual No. 7.

- administrative services and research staff at ARRB
- those concerned with text and information handling and report production in other organisations.
- microfiche as a medium provides an effective, cheap, and portable reference medium for both text and diagrammatic material
- the use of word and text processing systems makes direct micro-publishing economic
- computer facilities now readily available provide remarkable flexibility in error-free production and reproduction of both graphic and textual materials including slides and films
- the use of FAMULUS is worth investigation for library cataloging, accession bulletin, and KWIC index production
- that source text at ARRB should, where possible, be input to and held on magnetic media
- a continuing review of information handling, report and slide production capabilities will continue to offer improvements in efficiency and service level in information handling within ARRB
- in view of the wide relevance of these issues and options to research workers and administrative staff this Manual should be reviewed and if necessary revised on a regular basis
- that COM be used to document and archive computer systems as well as reports
- that ARRB staff make use of the portability of fiche as a reference medium to carry more of the relevant ARRB material for use or personal distribution interstate and overseas

WIGAN, M.R. (1979) : ARRB MICROFICHE PRODUCTION AND ARCHIVING AND ITS ROLE IN THE ARRB INFORMATION SYSTEM. Australian Road Research Board. ARRB Discussion Note 263 Final. September. 30p

KEYWORDS: Information documentation/digital computer/bibliography/transport/highway/ information retrieval\*/microfiche\*

ABSTRACT : ARRB publications and internal reports are now held in archival form on 24X microfiche as A6 diazo sheets with a readable heading strip. This permits reliable, cheap, and ready access to copies of out of print materials produced over the period 1960 to date, and is also a comprehensive reference system for all current ARRB published material including Internal, Research and Special Reports, Proceedings of Conferences and other meetings and the Board's quarterly journal Australian Road Research. This archive now makes possible comprehensive reference use of scarce printed materials in a cheap and economic medium for prompt servicing of internal and external users, at substantial savings in copying and mailing costs. The procedures used, and standards adopted, are covered. The use of Computer Output Microfiche techniques provide similar support for computer documentation, support and software release is also specified and the place of microfiche as a medium within the spectrum of ARRB document production and distribution is discussed.

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## FIRST ABSTRAGE TYPE

ARRB publications and internal reports are now held in archival form on 24X microfiche as A6 diazo sheets with a readable heading strip. This permits reliable, cheap, and ready access to copies of out of print materials produced over the period 1960 to date, and is also a comprehensive reference system for all current ARRB published material including Internal, Research and Special Reports, Proceedings of Conferences and other meetings, and the Board's quarterly journal Australian Road Research. This archive now makes possible comprehensive reference use of scarce printed materials in a cheap and economic medium for prompt servicing of internal and external users, at substantial savings in copying and mailing costs. The procedures used, and standards adopted, are covered. The use of Computer Output Microfiche techniques provide similar support for computer documentation, support and software release is also specified and the place of microfiche as a medium within the spectrum of ARRB document production and distribution is discussed.

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**GRID AREA** 

#### ACKNOWLEDGEMENT

The active assistance of Peter Tredrea of ARRB, Bob McKay of CSIRO, the Micrographics Association of Australia and the software team at Leigh-Mardon Pty. Ltd. is gratefully acknowledged. Substantial effort has been spent by ARRB in organising and making accessible and retrievable the large body of work carried out by ARRB since its founding in 1960. Each project in turn has been reviewed by the Executive Director, Dr. M.G. Lay and a concise summary of the procedures, personnel, results, costs, and published and unpublished documents produced added to a cumulative reference document. The first volumes of this series of "Collected ARRB Research" were published in 1978 and 1979 (Lay, 1978, 1979 $\alpha$ ) and a further volume is in progress.

The long standing bibliographic efforts of ARRB gave rise to a series of Australian and New Zealand Bibliographies on roads and road traffic covering major published and unpublished retrievable Australian material in four volumes from 1957 to 1971 (Mathieson 1967, 1969, 1972, 1974). The ARRB work published over that period is to be found referenced in this source. In the course of the production of Lay (1978), a considerable number of documents were retrieved from various sources and given reference numbers in the AIR (Australian Road Research Board Internal Report) series with retrospective effect. Consequently, the Mathieson bibliographies (1967, 1969, 1972, 1974) do not in general contain these references.

The present Australian bibliographic system operated by the ARRB information services is the Australian Road Index (ARI) (ARRB 1975, 1976a, 1977a, 1978a, 1979a and b), which was initially (for 1975) limited to author, title, organisation and bibliographic reference for each entry. The Road Index coverage was - and is - intended to cover all published and unpublished material produced in or written about Australian road and road transport subjects, and all new ARRB internal reports are automatically included. From the 1976 volume onwards the ARI entries included keywords and indices for retrieval, and from the 1977 volume full abstracts are also included. Reference to ARI will therefore cover all recent material in a concise and helpful manner. Since ARRB became the Australian input centre for the OECD IRRD information retrieval exchange system (Bays  $1976\alpha$ , b and c, 1977), a substantial proportion of ARI goes forward to the IRRD, and both ARI and IRRD are presently maintained by ARRB as on line data bases within the AUSINET system (Staind] and Bays 1977).

These retrieval and reference systems are now offering excellent coverage and accessibility to the Australian user, and the accumulating volumes of "Collected ARRB Research" are progressively providing a similar service for ARRB historical material which is not always covered by the systems described. The Annual Reports (ARRB, 1976, 1977, 1978) have covered all released AIR's produced since 1 July 1975 in a project context.

The present report covers the assembly of an archival reference set of ARRB materials in microform much of which was previously available only in the form of single reference copies, and relates this to the other means of document data capture, manipulation, and retrieval available to and within the ARRB. This report complements Lay (1979b), who specifies the manner in which the information serviced by the techniques discussed here is brought into a retrievable form, and how it is subsequently used by those needing access to it.

This archive completes the pattern of information retrieval, reference, and bibliography by ensuring that ARRB documents so referred to are physically accessible and may be economically reproduced when required. An additional benefit is a comprehensive self indexed physical file of all the ARRB documents held in this form. As the archive stands at present, there is a fairly substantial body of literature which has not yet been covered other than by reference in Collected ARRB Research, and which may in some cases not be held in any form at ARRB. These documents include some of the theses supported by ARRB submitted prior to 1975 and some of the papers in professional journals and conference proceedings by ARRB staff and ARRB supported external projects which did not pass through any ARRB series in draft or final form, as (for these few documents) no copies were received by ARRB.

However, for documents *published* by ARRB the physical coverage of the archive is believed to be complete, and all new documents produced at ARRB are now automatically covered. The archival nature of the system means that storage of the fiche masters must be under controlled conditions

"Under extreme conditions of elevated temperature and low or cycling relative humidities, gelatin photographic layers and backing layers on polyester base sometimes develop adhesion defects, such as slight edge peeling, flaking, emulsion cracking, etc., while similar layers on cellulose ester base under the same conditions do not exhibit these defects or do so to a lesser degree. For this reason the relative humidity is extremely important for permanent record storage. The recommended environmental conditions for archival storage are temperatures less than 21°C (70°F) and a relative humidity between 30% and 50%. It is essential that polyester base films for permanent records not only meet the requirements of this specification, but that they be stored under proper storage conditions. These are specified in pertinent American Standards AREA (ANSI 1976).

The initial backlog of fiche recording was carried out by McCarron Bird Microservice of Melbourne, Victoria. The place of microfiche production and use in the spectrum of ARRB capabilities in documentation and release of text and visual material is considered in Section 6.

#### 2. OBJECTIVES OF THE MICROFICHE ARCHIVE

The primary objectives of the microfiche archive are as follows:

- 2.1 Consolidate ARRB output in a compact, secure and retrievable format.
- 2.2 Provide an economic means of access and copying of unique ARRB material.
- 2.3 Reduce print number and storage requirements for transient documents which may be needed for later reference.
- 2.4 Provide a cheap means of airmail dissemination of results.
- 2.5 Make effective use of scarce manpower in maintaining computer systems and data sets in documented and retrievable form.
- 2.6 Provide an economic means of dissemination of computer programs and bulk data sets.
- 2.7 Provide a secure backup archive for software.
- 2.8 Provide a reserve basis for direct micropublishing of unique documents at economic cost if needed (Strawhorn 1975).

#### 3. USES OF MICROFICHE ARCHIVE

The objectives of the archive system also define the appropriate uses to which such an archive can be put. In view of the low cost of copying microfiche (98 document pages or 220 computer program listing pages for less than 25 cents this particular form of archive has several possible uses over and above the requirements for a secure and space saving static archive.

For documents held in microfiche it is possible and convenient to carry a substantial body of reference material with a small microfiche reader in a briefcase\* for interstate or overseas use and this has become increasingly common amongst Board staff since the system became fully effective. For computer records, the massive reference manuals and computer listings become manageable, and in fact are now very widely used in fiche format for computer programs and data sets in a normal manner, but reserve much of the technical reference details for a microfiche insertion into the printed quide. The same fiche format may be used to provide a complete reference version of the program, the test data, and the test results produced which can also be included with the guide at the economic cost of less than 25 cents. This is being done for the ARRB Technical Manual (ATM) series from ATM 4A (Luk, Makarov and Wigan 1979). In many cases this text and all technical details could be incorporated into this latter fiche as a single sheet (Strawhorn 1975 p.III 3.1-3, Kuney 1973). The value of this form of fiche record proposed for program, data, and documentation as an efficient tool for maintaining the integrity of support for software systems under development has already been recognised by the U.S. Urban Mass Transit Administration, and these proposals have now been adopted as part of the standard UTPS (U.S. DoT 1977) procedures. It does, however, mean that the documentary text must (usually) be held on magnetic media as the mixing of photographic documentary microfiche frames with Computer Output Microfiche (COM) frames is an awkward and expensive procedure at present. The implications of this are discussed further in Section 6

While the spread of parts lists and normal management reports on fiche has been extremely rapid in Australia, and banking (e.g. ANZ), planning (e.g. MMBW, Vic.), and public transport operating bodies (e.g. ACTION, A.C.T.) make extensive use of fiche formats for daily use, it must be recognised that the research and research using community has not yet become familiar with this medium. This naturally reduces the present utility of the ARRB fiche archive as an acceptable basis for document release, although there is every reason to be confident that this will become more acceptable in the future as office and official body COM and fiche usage continues to rise. At the date of writing fiche readers are not sufficiently widely available to research workers for fiche copy release systems to be worth considering by ARRB. This should be reviewed on an annual basis in view of the general rate of increase in microform usage.

It should, however, be noted that as early as 1974-5 the economics of microfiche publication of journals had become cost-liquidating:

"Benefits

Within the present (1975) state-of-the-art of microform readers, offering a journal on microfiche as well as hard-copy is more a service to readers than anything else. To date, few readers have subscribed to the microfiche editions of journals that are available in both media. Publishers who have offered

\*a Microvision R42-48 reader measures about (40 mm x 20 mm x 250 mm).

the option have not found it to be a profit-making venture, although it generally brings in enough income to pay for itself.

The last point is worth some further consideration. The economics of micropublishing are so much more favourable than those of print-on-paper publishing that a publisher can afford to offer the microform option, and have it recover costs even though only a very small fraction of the total readership selects it (generally under 5%)." (Strawthorn 1975 p.III.1.1).

#### PROCEDURES FOR THE MICROFICHE DOCUMENT ARCHIVE SYSTEM 4.

#### 4.1 TITLING CONVENTIONS AND FORMATS

The accurate identification and retrieval of microfiche documents is very similar to any other indexing system. ARRB is identified by a logo on the top left hand side of the Title Space, and the title and bibliographic data and the fiche numbering system complete the heading in positive format. This means that the data stand out in black (or blue) against a clear background.

The body of data on the fiche is recorded in negative mode, where the text shows up in white on a black (or blue) background.

The titling conventions are slightly different for each series of documents. Fig 1 shows the Title Space layout for an internal report, the most numerous type of ARRB record.GRID AREA

ARRE Logo	Document isquing body	Optional	Fiche
AILED DOGO	bocumente tooutry body	4	Number Total
AUSTRALIAN ROAD	¥	RESTRICTED	+ +
	Australian Road Research Board		Fiche 1 of 3
	Internal Report AIR 399-3	+ Series Title a	nd Reference No.
RESEARCH BOARD	Hackett, W. and Bloggs, G.A. (1980	)) $+$ Author(s) and	Year of Issue
	The repudiation of a fundamental	+ Tert Title	

#### FIG 1: Layout of AIR series microfiche

The RESTRICTED label is occasionally required, but only for this series, and appears between Australian Road Research Board and the fiche numbering and grouping record. Each fiche is titled as 'Fiche x of y', where x is the sequential number of the fiche in the total number of y required to film the whole document. As the ARRB standard uses 98 pages per fiche, this gives a quick reference aid as well as an assurance of holding a complete document. This top line remains the same for all documents other than jointly sponsored Symposia or Proceedings, where Australian Road Research Board' may be replaced by 'ARRB-BTE' or 'ARRB-ADOT' or 'ARRB-CIE (Vic.)' or any other relevant combination.



Australian Road Research Board Fiche 6 of 8 Research Report ARR 99 Artichoke, K. (1981) The reinvention of .....

FIG. 2a: ARR Series format



Australian Road Research Board Fiche 1 of 3 Mt. Gambier (1973) 9th Regional Symposium Proceedings: Roads and Tourism and Road Management

FIG 2b: ARRB Symposia format



Fiche 1 of 3 Australian Road Research Board Conference 8th Perth, 1976 Proceedings Vol. 8 Part 3. Sessions 7-13 Materials, construction and maintenance.

FIG 2c: ARRB Biennial Conference Proceedings



Australian Road Research Board Fiche 1 of 1 Lav. M.G. Annual Report 1976-77

Fiche 1 or 1

ARRB Annual Reports of the Executive FIG 2d: Director



Australian Road Research Board Special Report SR 11 Tynan A.E. (1974) Ground Vibrations, and Damaging effects to buildings.

FIG 2e: ARRB Special Reports



Australian Road Research Board Journal September 76 Vol. 6 No. 3 ISSN 0005-0164

Fiche 1. of 1

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FIG 2f: ARRB Journal



Australian Road Research Board Fiche 1 of 1 Technical Manual ATM 4 Luk, J.Y.K. and Wigan, M.R. (1977) ARRBTRAFIC: .....

FIG 2g: ARRB Technical Manuals

Fiche 1 of 1 Australian Road Research Board J. Roy. Statist. Soc. B (39) 381. Robinson, G.K. (1977) Conservative Statistical Inference. FIG 2h: ARRB Staff External Publications

FIGURE 2:

FORMAT FOR TITLING

The second line of the Figure in Fig. TIPEs 'Internal Report AIR 399-2'. This specifies the series (Internal Report) and the reference number in that series (AIR 399-2). For the internal report series, the numbering system provides further information, as '399' denotes a report connected with ARRB project number 339, and '-2' denotes the second Internal Report from that project. Other series of reports have slightly different formats for this second line: (a) Australian Road Research Board Research Reports become: 'Research Report ARR 99' (b) Australian Road Research Board Bulletins became: 'Bulletin No. 28 (1968)' and therefore also include the year of issue. (c) Australian Road Research Board Symposia become:

'Symposium 10th Regional. Launceston, 1974'

and therefore also include the year of issue and location of meeting.

(d) Australian Road Research Board Biennial Conference Proceedings become: 'Conference 9th, Brisbane 1978'

and therefore include year and location of meeting: the 9th Conference will lead to 'Volume 9: Part ... Do in the second line.

- (e) Australian Road Research Board Annual Reports become: 'Lay, M.G.' and therefore specify current Executive Director.
- (f) Australian Road Research Board Special Reports become: 'Special Report SR 10 (1977)' and therefore specify year of issue.
- (g) Australian Road Research Board Journals become: 'Journal Vol. 3, No. 4, December 1967' and therefore complete the correct bibliographic reference.
- (h) Australian Road Research BOard Technical Manuals become: 'Technical Manual ATM 5'.
- (i) External papers by ARRB staff become:'Journal, volume, number, pages'.

The third line of Fig. 1 contains the authors' names and initials, and the date of issue of the report concerned. Once again, variations occur:

(a)	ARR Series:	are identical to AIR series as shown
(b)	Bulletins:	simply have the Bulletin title
(c)	Symposia:	simply have the relevant Symposium tille
(d)	Conferences:	become 'Proceedings Vol. 8 Part 3 with line 4 as:
		'Materials construction and maintenance' Sessions 7-13.
(e)	Annual Reports:	become 'Annual Report 1976-77' and therefore specify

(f) Special Reports: are identical to the AIR series as shown

- (g) Journals: have ISSN number here: e.g. 'ISSN 0005-0164'
- (h) Technical Manuals: are identical to AIR series as shown, but in the case of computer programs the system generation number corresponding to the printed document should appear on the archive document fiche (see Section 5.1 also).
- (i) External papers: have 'Author (year) title' on this line.

Each of these is illustrated in Fig 2. Discussion Notes are not fiched.

4.2 STANDARDS FOR AUSTRALIAN ROAD RESEARCH BOARD FICHE

The basic decisions to make are as follows:

- 1. Positive or negative records for titling?
- 2. Positive or negative records for text?
  - 3. Number of frames per fiche?
  - 4. Density of fiche dark areas?
  - 5. Colour of fiche dark area?
  - 6. Resolution standard on fiche copies?

The decisions made were:

- 1. Microfiche were to conform with Apstralian Standard, AS 1998 (SAA 1977).
- After several trials, it was found that positive records for titling were a distinct advantage, and produced a clear self documented and easily read visual reference on the Afiche itself.
- Negative records for text proved to be the most legible, gave the best results for poor quality original materials, and the least eye-strain.
- 4. The 24X standard for magnification gives 98 frames/fiche. It is the denser of the two formats specified in AS 1998, is the standard used by Xerox University Microfilms Ltd., and is the predominant format used by NTIS, the U.S. Government Clearing house for Government publications. The 24X standard requires only low quality readers, and permits wall projection display direct from fiche without unusually high quality bulbs or lenses.
- A background density of 1.1 was adopted as within the range permitted by AS 1998 and as a compromise between fiche to fiche reproduction and hard copy printing resolution requirements. It has proven to be excellent.
- Dark blue fiche were consistently found to be more legible and less tiring to read, and were therefore chosen.
- 7. Resolution standards were set at the low and easily reached standard of visual resolution of a test display of closely spaced lines at a density of 40 lines/mm: admittedly superior to most NTIS fiche copies, but well within the capacity of even inexpertly handled Bell and Howell planetary cameras and equivalent data capture equipment. 4.5 line pairs/ mm on the original fiche copies supplied has proved to be an acceptable standard for practical use. To permit such a check, all ARRB fiche sets have as the first frame on the first fiche of each set.

The ISO test chart Number 3 (Fig 3) Type some standard test sheet embodying this test pattern. This pattern is called up by AS 1998, and is explicitly stated to be the U.S. National Bureau of Standards pattern in the ISO Standard 3334 (ISO 1976) also referred to in AS 1998. One of the common test sheets used which incorporates this pattern is that issued by the National Microfilm Association (NMA 1973), which also includes a scale indicating the number of frames per fiche (98 for 24X) and a heavy overprint of '24X' or the relevant standard reduction ratio corresponding to the number of frames per fiche. Most of the ARRB fiche produced to date embody the MT-3 Image Evaluation Test Chart (PSC, undated) which includes several copies of the ISO-2 test pattern and a linear marker indicating a 6 inch (imperial) fiche dimension. Visual resolution of 4 line pairs per mm (the 4.5 block) has been found in practise to be a good working document fiche standard, and corresponds to the visual resolution offered by the *best* of the NTIS fiche copies as usually supplied.

- 4.3 CYCLE OF FICHE PRODUCTION
- (a) The overall responsibility for the establishment and maintenance of the system is vested in the Deptuy Secretary and most of the specific maintenance duties will be performed by the ARRB Equipment Officer (EO).
- (b) AIR's: The ARRB Research Coordinator issues one hard copy of each new AIR to the EO for fiching. When applicable the EO ensures that 'RESTRICTED' appears in the titling and that the eventual issue of these fiche is only to authorised people.
  - DO NOT
- (c) Other ARRB produced publications: As copies are recieved into the ARRB store, in accordance with a standard initial distribution list one copy of each is sent to the EO for fiching.

#### GRID AREA

- (d) The EO ensures that all publications to be fiched have been sent to him by cross-checking against a master list of publications in the ARRMS\* register. He records against each publication the batch date identification when the publication is forwarded to the fiche contractors. Each batch sent in is accompanied by an ARRB purchase order and a full listing of individual publications including the titling specified for each. The ARRMS register also serves as a check list and record of the receipt of fiche of acceptable quality and of the return of the hard copy manuscript.
- (e) All requests for the microfiching of publications other than those with an ARRB imprint will be referred to the ARRB Deputy Secretary who may seek direction from the Executive Director.
- 4.4 STORAGE AND SECURITY
- (a) Stock duplicate fiche are kept by the EO in a locked cabinet.
- (b) The fiche contractors will generally be required to retain the original fiche. However, it should be noted that the original contractors did not keep the original master silver halide fiche in fire protected or environmentally controlled storage, and the security was limited to the goegraphic separation of the otiginals held by the contractors and the duplicates and hard manuscript copies at ARRC. (Lesser quality but reasonable originals can be taken off a duplicate). The roll film used is also kept by the contractors under supposedly fire-resistant conditions.

\*ARRMS: Australian Road Research Board Manuscript register.

- (c) If only one copy of the hard copy isoavailable before sending off for fiching, the normal procedure would be to duplicate the hard copy.
- (d) If the fiche is marked, (or directed to be so considered) 'RESTRICTED' then duplicates can only be issued on the authority of the Executive Director. Special precautions guarding against the unauthorised issue of these fiche will be taken by the EO who will retain the keys to the fiche storage files at ARRB.
- (e) As publications are ready for fiching they will be batched and despatched to the fiche contractor. The frequency will depend on the number of publications but should be at least monthly. The number of duplicates ordered will generally depend on the expected short-term demand but will normally be one original plus 10 duplicates. Upon receipt, the ED will check the microfiche for quality.

For publications fiched prior to 31/12/76 (with the exception of 8th Conference Proceedings) initially, 1 original and 2 duplicates were produced.

(f) Duplicate fiche are kept by the E0 in sequential order for each type of publication: the visual heading strips of the fiche thereby provide a self-indexed filing system. They are issued by him as required, however one duplicate is always to be retained pending the receipt of re-ordered fiche. The quantity of fiche re-ordered is directly related to historical or anticipated demand.

DO NOT

TYPE OUTSIDE

**GRID AREA** 



Fig 3: Arrangement of test patterns in ISO test chart No. 2 (actual size)

(Source: ISO 1976)

#### I. INTRODUCTION

<u>SHAZAM</u> is a comprehensive computer program for econometricians, statisticians, engineers, sociometricians, psychometricians, politicometricians and others who use techniques common to econometrics. SHAZAM is relatively easy to use and has great flexibility. The costs of using SHAZAM are generally much lower than other general computer programs. SHAZAM has primary capabilities in regression analysis, simultaneous equation estimation, and principal components. Secondary capabilities are in factor analysis, analysis of variance, and plotting variables. In addition SHAZAM provides extensive data manipulation capabilities and can generate various random probability distributions. In short, SHAZAM lives up to its name (Solomon, Hercules, Atlas, Zeus, Achilles, Mercury). A SHAZAM deck is normally split into 6 sections named after each of the above.

Special features of the regression analysis section of SHAZAM include: Hypothesis Testing on Linear combinations of coefficients, Restricted Least Squares, First and Second Order Maximum-Likelihood or Iterative Cochrane-Orcutt Autoregressive models, First Order Autoregressive models with a Lagged dependent variable, Testing of residuals for normality, Exact and higher-order Durbin-Watson tests, Forecasting, Ridge Regression, Box-Cox and Box-Tidwell regressions, Box-Cox Autoregressive models, Autoregressive models with missing observations, Gram-Schmidt regression, Two-stage Least squares, Regression on principal components, Three Stage Least Squares, Iterative Three Stage Least Squares, Multivariate Regression, Seemingly Unrelated Regressions, and Regressions using Householder Transformations.

SHAZAM will accept up to 99 variables and an unlimited number of observations. Memory is dynamically allocated so that the size problem is virtually eliminated. However, if large amounts of data are used it may be preferable not to store all the data in memory. SHAZAM has various capabilities to handle this problem so that a massive amount of memory is not required. Users should always be aware of the version of SHAZAM that they are using. This manual describes Version 2 of SHAZAM.

SHAZAM was written in FORTRAN by Kenneth J. White. The development of SHAZAM began in 1969 at the University of Wisconsin and continued at Rice University and the University of British Columbia. Comments on improvements to SHAZAM or this manual are welcome. All questions on SHAZAM usage should be referred to K. J. White or a SHAZAM consultant.

Fig 4 - Bromide produced on a COMp 80/2 directly from magnetic tape containing unprocessed source code in COM font.

#### 4.4 RETENTION AND INDEXING PROCEDURES IE OF TYPE

The archival nature of the ARRB microfiche system is asserted by the retention of all microfiche masters at the fiche service.

The further ARRB functions of overseas airmail supply and supply when hard copy runs out or is otherwise not available are sustained by the EO who will supply microfiche copy on request at the advertised airmailed price (\$1 min.).

# 5. PROCEDURES FOR COM\* MICROFICHE COMPUTER DOCUMENTATION SYSTEM

The handling and storage of computer programs and documentation is often made difficult by the substantial bulk of both source code printouts and documentation. The frequent revision of both, and the need to keep both closely in step means that the costs of the associated printouts can become substantial and, quite apart from the archival aspects of a COM procedure for secure and compact control of computer systems, the costs of paper and storage space required by the production of necessary and frequent complete printouts of major systems and data files can become a further reason for adopting a less expensive means of bulk output.

The procedures, responsibilities, production, tilting, storage and indexing of COM files of this type are all quite different from those of a documentary archive. The CSIRO system for program documentation and maintenance is integrated with word processing and typesetting software (Anon 1978), and direct production of fiche and printing production masters on the Information Systems International COMp 80/1 in Canberra, and illustrates the considerable coherence and efficiency gains to be realised (Holden and Hurdle 1978). As all programs of any note should be supported within ARRB with a suitable ATM as documentation, this has been pursued with the local III COMp 80/2 at Leigh Mardon Pty. at Moorabbin.

The facilities available in Canberra on the CSIRO COMP 80/1 and from Leigh Mardon's COMp 80/2 (the only two COMp 80 sites presently in full operation in Australia) differ. The COMp 80/1 generates its display on a 16 k x 16 k master scan matrix, while the /2 uses a 65 k x 65 k raster scan matrix and has additional capabilities. The local site (Leigh Mardon) also includes a III 3600 image scanner, which can digitise half-tone pictures for subsequent manipulation and inclusion in COMp 80 computer controlled page layout and typesetting. This scanner can also digitise diagrams in a faster mode which ignores grey scale niceties a considerably greater speed. The COMp 80/2 has a range of output cameras and devices permitting direct production of very high quality COM microfiche using COM characters (which are a simplified and standard font: see Fig 4), or - at greater cost - using graphic (full typesetting quality) characters. Slides, films, and direct bromide roll production is also available. The most economic approach, if using this facility for COM and bromide production, is to produce microfiche using COM characters, and bromides using graphics characters in monospaced layout (see Fig 5), as the considerable extra computer cost in generating graphic typesetting characters is swamped by bromide material costs per frame, and thus attracts only a comparatively small additional charge. The use of a COMp 80 for COM produces very high quality fiche, but is not generally

#### 2. WHAT THE MODEL DOES

There are an enormous number of features of traffic on rural roads which could be modelled. Some of these features are unlikely to be of interest for any potential use of a rural road traffic model. However there are some features which could be useful but which have not been modelled. When using the model it is extremely important, as with all modelling, to remember that a model is only a tool. It is only useful in so far as it aids decision making. The aspects of real behaviour which need to be modelled are those to which the decision-making is most sensitive.

The decisions which most often need to be made about rural roads are whether to provide auxiliary lanes and what standard of sight distance and road alignment to provide. In light traffic, low standard roads delay vehicles mainly because slow vehicles delay faster vehicles. For a model to estimate the improvement in traffic flow which would be achieved by a road improvement the modelling of overtaking is crucial. For moderate and heavy traffic other factors are also important. In particular, the capacity of merge areas may be a crucial feature.

It is worth noting that the model can be used to estimate the sensitivity of travel time to input parameters and so be a guide to its own calibration. It should be remembered that travel time differences, not absolute travel times, are important and that these may be less sensitive to some input parameters. E.g. to make vehicles follow at larger headways than usual would affect average travel time more than it would affect the estimate of the improvement provided by an auxiliary lane. Several characteristics of vehicle types used in the model are intended to allow such sensitivity analyses to be performed readily. It is not expected that data be collected on all vehicle characteristics.

It should be remembered that roads last long enough for vehicle and driver characteristics to change during their lives. There is no sense in determining the characteristics of vehicles to such great precision that the conclusions drawn from the modelling of traffic can only be considered to be valid for a particular type of traffic flow which only occurs at some times of the day, week, or year or which may never occur again. Rather it is necessary to vary the parameters of the model to check that your conclusions are reasonably robust.

# 2.1 ASPECTS OF THE BEHAVIOUR OF VEHICLES ON RURAL ROADS WHICH ARE MODELLED

It is convenient to describe the aspects of driver and vehicle behaviour which TRARR attempts to model in terms of situations of increasing complexity. To completely specify the logic of TRARR would be very difficult. The only detailed description of the logic of the simulation is the program itself. The meanings of the program variables given in Appendix 2 provide a moderately complete description. The rough description below is in terms which do not depend upon the terminology of the computer program. Note that many common traffic engineering terms are not used. Travel times are measured directly rather than discussing capacity and level of service. Before overtaking, drivers perform their own private simulations of potential overtaking manoeuvres rather than looking for a space in the opposing trafffic stream which exceeds some critical gap.

A vehicle which is not interacting with other vehicles is said to be free. Each vehicle has a desired speed which depends upon a speed limit which varies along the length of the road and can be thought of as summarizing the standard of horizontal alignment, pavement width, roughness and legal speed limit. Free vehicles try to to travel at their desired speed but may be restricted by having

> Fig 5 - Bromide produced on a COMp 80/2 directly from a magnetic tape containing unprocessed source code, in a graphics font (monospeed).

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competitive with specialist COM Bureaux, who can produce good COM fiche at highly economic rates, on other than quality grounds. However, typeset output is available directly on bromide (as shown in Fig 5) without any further manipulation.

To use the typesetting layout, hypenation, and justification facilities on a COMp 80/1 or /2 would require either the user or a compositor to insert layout commands, and then to have the text run through front end typesetting, layout, and hypenation software. This can be done on both the COMp 80/1 and /2 sites. The /2 site also has the capability of scanning diagrams (and photographs) and rescaling and positioning them in the output. This is not available on the /1 site at CSIRO.

CSIRO offer two idfferent printing output facilities: any lineprinter format file can be put out to either bromide or fiche using only the crude COM character font; or bromides can be produced using the range of character fonts via COMTEXT (CSIRO 1978 $\alpha$ ). COMTEXT can produce page setups for typeset full size acetate sheets or bromides, fiche at 48 x, 35 mm film, or 16 mm sprocketed film (CSIRO 1978b).

The COMp 80/2 site also has vector plotting software for the 65 k x 65 k addressable grid, and can be used directly to make multiple overlay films (i.e. colour processable), slides, fiche, or bromide outputs with excellent resolution. These facilities may shortly be used to produce a monochrome film directly from the output of the ARRB rural road traffic simulation modelwritter by G.K. Robinson (1979) as part of Project 290 (Warrants for Auxiliary Lanes) and could especially well be used to directly produce a microfiche or series of bromides or slides of the frames simply by changing the cameras mounted on the COMP 80 at the time.

Computer Output Microfiche Can therefore be interpreted more widely when such effective devices for transforming and present text on visual outputs from ARRB are available without further manual input of the source material and the time and error potential involved.

The remainder of this section will be restricted solely to COM of test or source code material, but the place of microfiche and other output media in the spectrum of ARRB needs is taken up again in Section 7.

#### 5.1 COM TITLING CONVENTIONS AND FORMATS

The essential data to be recorded on the headers COM output are:

- (1) Program alpha-numeric identification,
- (2) Generation number of program,
- (3) Date of generation of code (NOT the date of fiche production)
- (4) Fiche sequence number of 'n' fiches,
- (5) Organisational identification, and
- (6) Status of the fiche ('RESTRICTED' or not).

In view of the need for prompt, cheap, and simple COM production, the automation of the above data is highly desirable. This is especially true of the date of program generation and code generation number. While these can both be specified on the cover slip for a green magnetic tape to be fiched, it is essential that the responsible officer for the system check the code generation date in the code against the title header when the fiche returns. A further highly desirable datum Gs Afframe index to be generated as the code is processed onto the screen for fiche camera presentation. Logically every 'PROGRAM', 'SUBROUTINE', 'FUNCTION', and 'BLOCK COMMON' statement encountered should be abstracted by the COM system and consolidated with frame XY reference codes as an index frame to terminate each fiche. This is, of course, a FORTRAN-oriented statement, and will require revision or extension for ALGOL, PASCAL, etc. code bodies.

The minimum data set to appear on *every* fiche produced should therefore be as shown in Fig 6.

If confidentiality is involved RESTRICTED

ARRB

"SYSTEM NAME"

DATE .. .. ..

FICHE ... ...

alphanumeric code name in "" Day Month Year

3 digit fields

Fig 6: MINIMUM COM TITLING REQUIREMENTS

This fiche should be clipped to the master documentation as amended for the specified generation date of the code (or job run for production output). Clearly the generation date should also be marked prominently on the documentation.

The fiche production for the documentation should be repeated regularly but not necessarily at every generation date - or even every tenth. The inclusion of the generation date on the fiche header of the relevant ATM will ensure that documentation and system match up, and there is no need to continually revise the printed ATM as long as the generation number current at the freezing of the ATM is shown clearly on the ATM cover or fly sheet pages. The computer code corresponding to that generation will therefore be retained on fiche, but subsequent code updates will only be held to the last rerun of the COM procedure.

Depending on the COM fiche bureau concerned, an index of procedure/ program/subroutine statements should be included as the last *frame* of any fiche in the series produced from the source tape.

#### 5.2 STANDARDS FOR ARRB COM FICHE

The fiches for COM output of program source and job run output can, and should, be photographed at a smaller scale than documents. The 24X standard adopted for documents is therefore inappropriate, and a 48X standard is recommended. For very large systems an even higher magnification may be used if necessary, but 48X is also the standard for fiche produced on COMp 80 machines, to take some advantage of the fine resolution available on these systems.

The use of *blue* diazo film with negative imaging copied to a density of 1.1 is required for copies, in accord with the document standard.

The inclusion of the micrographics test sheet is not required, as:

- (a) a visual check across all rows and columns will be essential to ensure the integrity of the output record (a user responsibility of course); and
- (b) few facilities are yet available in Australia for a simple process capable of mixing document filmed and COM produced frames on the same fiche.
- 5.3 CYCLE OF COM FICHE PRODUCTION

The responsibility for COM fiche production and the marking of 'RESTRICTED' or not rests with each project leader. The interface with the COM bureau will be the task of a single nominated ARRB Applications Programmer specifically concerned with computer work for each such project. Project leaders will be responsible for:

- (a) Maintaining the physical security of restricted or confidential material held on fiche.
- (b) Ensuring that the generation date for each of their systems is noted on *every* occasion of a change.
- (c) Producing a fiche backup of *source code* and *test data* to match the ATM or other documentation produced and ensuring that *generation dates* are clearly marked and do indeed correspond.

(d) Updating the fiche and documentation backup at appropriate intervals.

(e) Marking source or output files 'RESTRICTED' if required.

The production procedures for COM output from source files are - or can be - remarkably simple. As an illustration, Appendix A shows how the Quantor interactive software at Micromation in Melbourne is used to set up a subsequently repeatable standard procedure for COM output from text and numeric files produced daily by the ANZ Bank. As can be seen in this example, standard overlay patterns for table or other special background layouts or pictures are easily handled, although such a 'form splash' can cost up to \$250 as a onetime charge for initial preparation, and is therefore normally used only for regular reports: for 'form splash' applications a COMp 80 service would be more economic.

Before large-scale tabular outputs are printed from ARRB magnetic files, it may well prove to be worthwhile to check on the relative economics of direct COM fiche production - especially if regular reference use by several people of the tabulations and listings concerned is likely from the substandard basic data holdings now at ARRB.

Several new applications of COM at ARRB are now both possible and desirable now that the Board's accounting, mailing lists and project management records are all held on magnetic media. The ability to produce compact COM records on fiche cheaply from magnetic tape files can be used to compact bulky accounting records which must be kept for six years and will require sub stantial storage space due to the bulkier forms of printed output now used within the Board: similar opportunities are now available for other routine records and may be taken up as appropriate. At a simpler level, when standard computer systems are being archived at ARRB, the updating procedures for maintaining the integrity of the archive tape as upgrades come through can be expensive in the use of magnetic tapes. As tapes cost between \$10 and \$25, there is a real cost benefit in the small reduction in numbers possible if COM snapshots are taken to back up each documentation release, as such a COM fiche will normally cost substantially less.

When using any information which is to be transformed after reading from the tape and before COM output, a number of simple checks should be carried out. Appendix B is a microfiche layout form and checklist recommended Micrographics Association of Australia\* as an aid for this task.

When IBM or IBM-compatible labelled tapes are used, it is strongly advised that where possible, the header label and volume label data are transferred to the first frame produced on the fiche. The Quantor software at - for example - Micromation of Melbourne is already designed and set up to carry out almost any variation required on IBM and IBM-compatible tapes and labels.

#### 5.4 COM STORAGE, RELEASE, AND INDEXING PROCEDURES

Unlike document microfiche systems, source files held in microfiche as a reference format need to be kept with the complementary full size descriptive hard copy documentation (unless this too is re-fiched each time a documentation or system update is covered). Fiche dating provides a self-indexed system for successive updates of the same program, and manual notations should be made on the corresponding *complete* hard copy documentation. Quite a number of minor amendments to manuals can be accepted before revising the documentation as long as a list of amendments, dates, and corresponding backup fiche identifiers are kept with the documentation. These tasks are the programmers'.

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When fiche are 'RESTRICTED', then the documentation and the fiche should be kept separately. There is usually little secretive or sensitive about the documentation - it is the source code that has the value. In such ' cases the fiche should be kept secure with the programmer being held responsible for the formal commitments of the Board to security. Senior officers responsible for such staff must ensure that the precise terms of any confidentiality or restricted access agreement be given in writing to the programmer(s) involved in any such system, and that the minute be kept with the documentation.

Release, security, and retention of COM outputs are a research staff responsibility, and no involvement or records will be required of the Library. However, ten copies of the microfiche of the source code should be supplied to the Equipment Officer to file with the microfiche of the complementary manual on each occasion that the source code fiche is produced in an updated form. This is the responsibility fo the project leader or a manual author: e.g. in the case of Luk, Makarov and Wigan (1979), when Technical Manual ATM 4 has been updated to become Technical Manual ATM 4A, the source code fiche updating is the responsibility of A. Makarov, who is also the responsible Applications Programmer for fiche production under the provisions of this section.

\*P.O. Box 1447, Adelaide, S.A. 5001.

# Production Flow for a Typical Document



(Source: R. McKay, CSIRO)



Traffic flow in veh/h

Fig 2 - Changes in delay due to changes in traffic flows and signal settings

Fig 8 - Bromide produced directly from the 24X silver halide master microfiche produced by photographing a copy of ARRB Report ARR 75.

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#### 6. MICROFICHE IN CONTEXT AS PARTYOF ARRB CAPABILITIES FOR DOCUMENTATION AND RELEASE OF TEXT AND VISUAL MATERIAL

The basic output of a research organisation is of two forms:

- (a) Written and illustrated printed material
- (b) Verbal presentations with visual aids.

In both cases substantial scientific time is required to produce, proofcheck, edit, store, retrieve, and update the material: however, the primary bottleneck usually lies in the data capture by typists or illustrators. Where material has to be totally reproduced after editing or updating, considerable extra time is required from scientific staff for re-proofing the material, and on the part of typing and illustrating staff for re-doing virtually the whole mass of the material. The initial capture of textual or graphic material on magnetic media (via terminals, etc.) opens up a wide range of alternative ways of improving or tailoring the subsequent editing, revision, and production processes. It also provides an effective and economic means of producing archival material such as microfiche, slides, or films as already discussed in this report. As every point in the data capture, analysis, production, editing, printing, and archiving chain of developing and releasing scientific results is vulnerable to multiple data entry problems to a greater or lesser degree, Table I lists a range of the facilities for data capture, manipulation, output, and recording at (or accessible to) ARRB. In view of the flexibility offered by COMp 80 facilities, Fig 7 illustrates the software and hardware content offered by CSIRO via any of their access modes. 'ED', 'CDC Control Language', and 'COMTEXT' are all CSIRO/CYBER 76 programs or soft-ware facilities, while the output devices correspond to those at ARRB with the exception of the COMp 80 (which produces fiche, film, bromides, slides, etc.).

While high quality graphics storage and retrieval is possible both by storage of original artwork, slides or by digitised files on magnetic tape, lower quality (but still acceptable for most diagrams drawn to proper slide standards of line width etc: (see Oliver and Tredrea (1976)) may be retrieved from good quality microfiche masters - or indeed copies. Figure 8 is a positive (white background) bromide produced *directly* from one of the user oriented negative (dark background) blue diazo fiche copies taken from the high density black negative master silver halide fiche produced by the ARRB contractor's step and repeat document fiche camera. The contrast and quality which can be retrieved directly from such a denser fiche with a black, rather than a blue, background are substantially better: low to medium density blues are better for human eyes to read, high densities of black are better for such photographic purposes.

The microfiche produced by the original ARRB contractors using a Dagmar step and repeat document microfiche camera were not required to be of exceptionally high quality, and indeed the original documents used to produce Fig 8 were the leaves of a printed copy of ARR 75, and not even the original printing masters or bromides. Consequently the quality results in Fig 8 are very easily obtained and improved upon if necessary. The ARRB bromide camera optics provide the main limitation on this recovery standard, and are incapable of resolving extremely superior quality 48X COM-generated microfiche without severe distortion and loss of resolution. The 24X document standard adopted is therefore an evidently effective compromise between storage density and image (and test) recovery capabilities as a working - yet archival - medium.

The new (late 1979) ARRB document microfiche contractors are in the process of obtaining a suitable bromide camera to offer this service directly:

#### DATA AND TEXT CAPTURE AND PROCESSING OPTIONS AT ARRB

	INPUT DEVICE	RECORDING MEDIUM	COMMUNICATIONS POSSIBLE	TRANSFER DEVICE	EDITING AND ALTERATION ON/BY	PRODUCTION OF PRINTING (OR SLIDE) MASTERS	PRODUCTION OF BROMIDES	PRODUCTION OF TYPESET BROMIDES	PRODUCTION OF FICHE	PRODUCTION OF COM FICHE	SLIDES/ FILMS
1. TEXT	1.1 Typewriter	(1) Typed sheets of paper	OCR 'B' typeface	OCR* at approx. 2 lines/second To any tape/floppy disc/cassette	See magnetic media (depends on OCR service)	4		-	-	-	-
		(2) Document microfiche	N/A	Photo reduction	Photo reduction	Photo reduction	Photo reduction	N/A	N/A	N/A	Enlarger
1	1.2 Terminal (Cyber)	200 mb disc	(1) Magnetic tape 556/800/1000 bpi:9t/7t	magnetic tape drive	XEDIT Disc PROSE	N/A	Photo reduction COMp 80/1/2*	COMp 80/1/2*	COMp 80/1/2*	Any COM service	N/A
			(2) ANSI/ECMA Cassette (Texas Instruments 733 ASR cassette terminal)	Cassette drive with ANSI/ECMA standard	XEDIT Disc PROSE	N/A	N/A	N/A	N/A	N/A	N/A
			(3) 8" floppy disc (via Texas Instruments 733 ASR cassette and/or Exorcisor) Single density IBM 3780 format, soft sectored	Single density floppy disc, soft sectored IBM 3780 format	XEDIT Disc PROSE	N/A	COMp 80/1/2*	COMp 80/1/2*	COMp 80/1/2*	N/A	N/A
			(4) Paper tape	Paper tape reader	XEDIT Disc PROSE	N/A	Singer 8400 Phototypesetter	Singer 8400 Phototypesetter	N/A	N/A	N/A
			(5) 2000 lpm train printer (upper case) train at present	N/A	XEDIT Disc PROSE	N/A	Photo reduction	N/A	N/A	N/A	N/A
			(6) Hydra upper/tower case printer	N/A	XEDIT Disc PROSE	Printer output (poor)	Photo reduction	N/A	N/A	N/A	N/A
			(7) IPSI Daisy wheel 50 cps word processor quality output printer	N/A	XEDIT Disc PROSE	Direct output	Photo reduction	N/A	N/A	N/A	Photo reduction
			(8) Modem link	Modem	XEDIT Disc PROSE	N/A	[COMp 80/1/2]	[COMp 80/1/2]*	[COMp 80/1/2]	[COMp 80/1/2]*	[COMp 80/1/2]
	1.3 Singer Graphic Set dual input keyboard	Cassette (Singer format)	Cassette reader (Singer format)	Singer phototypesetter cassette reader	Cassette	-	N/A	Singer 8400 Photomix Photocomposer	N/A	N/A	N/A
	1.4 Singer Graphic Set Edit Terminal	Cassette (Singer format)	Cassette reader (Singer format)	Casette	Cassette XEDIT	N/A	N/A	Singer 8400 Photomix Photocomposer	N/A	N/A	N/A
2. GRAPHICS	2.1 Hand drawn	Paper Sheets	<ol> <li>Magnetic tape</li> <li>Document ficha</li> <li>35 mm slide/negative</li> </ol>	<ol> <li>III 3600 Scanner*</li> <li>Enlarger</li> <li>Enlarger</li> </ol>	Disc	COMp 80/2* Enlarger Enlarger	COMp 80/1 Enlarger Enlarger	COMp 80/2	COMp 80/2*	COMp 80/2*	COMp 80/2*
	2.2 Terminal (Cyber)	<ol> <li>(1) Small paper plot</li> <li>(2) large paper plot</li> <li>(3) document fiche/printer</li> </ol>	Tektronix flatbed plotter Houston DP 8 roll plotter	III 3600 Scanner* III 3600 Scanner*	Disc LCGS PLOT 10 Disc LCGS PLOT 10	COMp 80/2*	Photo reduction Photo reduction	-	-	=	_
		(4) 200 mb disc	556/800/1600 bpi tape	Magnetic tape	Disc	COMp 80/2*	COMp 80/2*	COMp 80/2*	COMp 80/2*	COMp 80/2*	COMp 80/2*

NOTES: The archivel medium in each case is either a fiche or a slide: in general slides will be included in at lesst one report (on the fiche of that report), but this yields in general only a low grade quality retrieval archive.

\* device not available on-site at Australian Road Research Board

[ ] =very slow, and probably ill-advised procedure

XEDIT: CDC CYBER Text editor program

PROSE: CDC CYBER Word Processing program supplied with Pascal 6000 release

LCGS: CDC CYBER Low Cost Graphics Software

PLOT 10: Tektronix graphics softwear program

COM: Computer Output Microform

this is preferable to the use of the ARRB camera as the silver halide masters microfiche are vulnerable to damange, and should in any case be retained at the contractor's site for copying, security and back up purposes.

It is therefore worth noting on Table I the ability to produce slides and bromides (i.e. last resort replacement of original artwork) from the fiche document archive. The grid of such possibilities is not complete on Table I, which is intended mainly as a guide to the *types* of capabilities available or accessible within or to ARRC.

The use of microfiche as a medium for archival and reference purposes is therefore of evident value for engineering drawings and circuit specifications, and - if essential - recovery of the images would be possible if the normal reproduction masters were destroyed or mislaid.

The use of the very high quality 48x microfiche produced by COMp 80 systems is not limited to compact and stable archival reference purposes: the resolution which can be obtained on this type of microfiche can be remarkable. A high quality microscope optical system used at ARRB for geological and minerological purposes was used to produce Figures  $9\alpha$ , b from a small part of a single frame on a 48x silver halide master microfiche produced by the Leigh-Mardon COMp 80/2.

This quality is far better than could be obtained by direct photography of the equivalent computer line printer output, and for normal printing purposes there would be little point in proceeding to generate bromides on a COMp 80 directly from the computer tape by rerunning the fiche production job with a bromide camera in place of a fiche camera.

Similar results can be expected from graphics output produced either by vector plotting on the COMp 80, Gen by Rincorporation of the digitised version of a hard copy diagram by using the III Videoscan 3600.

TYPE OUTSIDE

Another illustration of the different ways of using the various forms data capture and retrieval is offered by the Australian Road Index (ARI). The function, aims and general operation of ARI is described by Staindl and Bays (1977), and the detailed specifications, program user documentation, and user's guide is given by Staindl (1979). Consequently only a very brief description need be given here.

ARI is an assembly of abstracts from transport literature of special relevance to Australia, and the basic text of abstract, author, keywords, source, and referencing (see Fig10) is transferred to magnetic tape via cards or direct terminal entry. These entries are then transferred on magnetic tape to the ARI online data base within AUSINET, and are also used as input to a series of programs which sort the entries, create indices (see Fig 11) and finally produces a paper tape with typesetting commands for the ARRB Singer 8400 photo-typesetter. This is then used to produce a bromide strip which is cut and pasted up to produce printing masters. Once the issue of ARI has been printed a copy is taken and photographed to produce a fiche.

This system is working well. However, as is evident from Table I, other possible alternative paths range from the direct micropublishing from the sorted magnetic tape stage on ordinary COM, to fully typeset and laid out bromides using full graphic art fonts, by using different combinations of facilities, and exploiting the fact that text data has been captured on magnetic tape for subsequent manipulation.

•	b2 = 0.0 63 = P(1) B3 = 1-P(1) B3 = 1-P(1)
	IF(BB.GE.D)GO TO 3047 CALL CH2(R2,P,Y, DELMAX) D3 = DELMAX
	$\begin{array}{rcl} DELMIN &= (1/(1-Y)) + (1/(2+P(I))) + (P(I)-1+R1) \\ D1 &= & DELMIN \\ ALP &= & ((G2-G1) + (R3-R1) - (G3-G1) + (R2-R1)) \\ CK2 &= & ((D2-D1) + (P3-P1) - (D3-D1) + (P2-P1)) / A1 \\ \end{array}$
	CK3 = ((D3-D1)*(G2-G1)-(D2-D1)*(G3-G1))/AL CK1 = D1-CK2*G1-CK3*R1 C2 = CK2
	C3 = -CK3 C1 = -CK2 + T(1) CC = CK1
047	CONTINUE CC = 0.0
Fig	9a. One third of a full lineppinter output page reproduced via microscope optics from a single frame of a COMp 80/2 48x fiche
	GRID AREA
	$G_2 = 0.0$ R <sub>2</sub> = 1-P(I)
	$D_2 = 0.0$
	R3 = 1-P(I)
	BB = 1 - RMAX(I) - P(I) IF(BB.GE.D)GO TO 3047
	CALL CH2(R2,P,Y, DEL
1-11-1	DELMIN = (1/(1-Y )) + (1

Fig 9b. One six

One sixth of a full lineprinter output page reproduced via microscope optics from a single COMp 80/2 48x fiche frame.

#### 34 0015 LAY,MG

IMPLICATIONS OF PROBABILISTIC METHODS IN STEEL STRUCTURES

PUBLICATION DATA: INTERNATIONAL CONFERENCE ON APPLICA-TIONS OF STATISTICS AND PROBABILITY IN SOIL AND STRUCTURAL ENGINEERING. 3RD, SYDNEY, JAN 29-FEB 2, 1979. PROCEEDINGS. VOL 3. ICASP 3 ORGANIZING COMMITTEE. NEW SOUTH WALES UNIVERSITY. SCHOOL OF CIVIL ENGINEERING, KENSINGTON, NEW SOUTH WALES. 1979. PP.145-56.

ABSTRACT: THE PAPER DESCRIBES HOW THE DEVELOPMENT OF LIMIT STATE DESIGN CONCEPTS HAS BOTH OPENED THE WAY TO A WIDER VIEW OF THE DESIGN PROCESS AND ALSO CALLED INTO QUES-TION SOME CONVENTIONAL VIEWS OF MATERIAL PROPERTIES. THE FORMAT OF MODERN DESIGN CODES IS DESCRIBED TO SET THE SCENE FOR THE SUBSEQUENT DISCUSSION. THE ARGUMENTS AD-VANCED ON MATERIAL PROPERTIES RELATE MAINLY TO YIELD STRENGTH AND FATIGUE. IT IS SHOWN THAT YIELD STRENGTH IS A FUNCTION OF A NUMBER OF VARIABLES AND IS FAR FROM A CONS-TANT. THERE IS SEEN TO BE A LACK OF ADEQUATE DATA ON THIS PROPERTY. FATIGUE IS NOW BEING BETTER UNDERSTOOD IN A LIMIT STATE CONTEXT BUT IT IS ARGUED THAT THE RISKS OF FATIGUE FAILURE MAY NOT YET BE WELL UNDERSTOOD BY THE CODE USERS. OTHER COMMONLY QUOTED PROPERTIES WITH RESPECT TO NON-DUCTILE BEHAVIOUR ARE SAID TO BE LARGELY IRRELEVANT.

KEYWORDS: STATISTICS/ STEEL/ PROBABILITY/ LIMIT/ DESIGN (OVERALL DESIGN)/ MODULUS OF ELASTICITY/ FATIGUE (MATER)/ FAILURE/ CONFERENCE/

7907AR065E 239267

#### DO NOT

# Fig 10 - A typical ARI entry

#### **GRID AREA**

**MATERIAL (CONSTR)** 22 0017 50 0002 30 0002 30 0003 31 0012 31 0017 52 0009 52 0019 34 0013 50 0005 52 0008 96 0027 MATERIAL DAMAGE: SEE DAMAGE MATHEMATICAL MODEL 10 0040 10 0041 10 0041 10 0043 10 0047 22 0011 26 0024 43 0001 72 0053 32 0021 52 0019 72 0069 41 0011 71 0008 72 0080 22 0019 24 0009 24 0012 42 0016 72 0043 42 0010 71 0009 42 0021 72 0051 72 0082 72 0100 72 0101 72 0108 72 0107 72 0109 72 0114 73 0025 91 0023 93 0020 **MEASURE: SEE MEASUREMENT** MEASUREMENT 23 0008 31 0004 22 0009 22 0010 52 0019 23 0004 24 0006 31 0008 72 0115 93 0017 53 0011 93 0021 93 0022 MEDICAL ASPECTS 72 0075 83 0016 83 0033 84 0001 **MEETING (CONFERENCE): SEE CONFERENCE** MELBOURNE, VIC. 10 0045 42 0023 21 0024 53 0009 72 0055 22 0018 24 0008 31 0009 31 0010 72 0042 70 0012 70 0016 70 0017 72 72 0062 72 0080 73 0026 72 0063 72 0056 72 0065 72 0044 72 0070 72 0087 72 0078 72 0079 72 0085 73 0039 72 0081 73 0038 72 0115 72 0107 73 0041 83 0020 83 0022 91 0016 93 0015 93 0021

Fig 11 - A segment of the computer generated ARI index

(Source: ARRB, 1979)

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2 Station Francisco F	REFERENCES PE
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UNIVERSITY COLLEGE LONDON COMPUTER CENTRE (1978). FAMULUS Reference Manual. Swift Printers, U.K. (97 p).	

As this manual was being completed a meport by Crennell (1979) came to hand which describes the problems and results of the development pangs of a similar range of applications within the Rutherford Laboratory of the U.K. Science Research Council, where the fiscal and manpower constraints imposed by reduced budgets and difficulties in obtaining support staff provided the initial impetus. Crennell reports on trials with frequently updated computer and equipment manuals, library catalogue records, KWIC indices, and accession lists, chemical symbol setting and cystallographic structure index production indexes with microfiche rather than paper outputs.

The Famulus system (UCLCS (1978)) was originally produced in 1969 by T.B. Yerke at the Pacific Southwest Forest and Range Experimental Station at Berkeley, California, and was substantially revised and updated by Shaw at University of London Computing Centre. This system proved to be effective in the hands of library staff, and the use of the KWIC index system has overcome many of the inadequacies of "the UDC scheme for ... specialised holdings" The catalogue and the monthly updates are produced on 48x microfiche directly, and the distribution costs were reduced sufficiently to maintain this service: "We could not afford the computer resources (and the postage) to print and distribute multiple copies of the catalogue on line printer paper": Crennell (1979), and to speed up the weekly accession bulletin considerably. Both results being a direct consequence of the early data capture on magnetic media of the material to be manipulated, indexed and printed.

As Famulus is readily available at copying costs, it may be worthwhile considering its use at ARRB for these same tasks for similar reasons.

DO NOT

Text and word processing is best used in conjunction with a good file control system, and the early - and most successful - results of the SCRAPBOOK system (Caskin, Robinson, and Yates: +1974) built and heavily used at the U.K.-National Physical Laboratory is a good example of the user acceptance of this type of tool. SCRAPBOOK itself has subsequently been widely promoted on a commercial basis (Triad 1977), and illustrates the broad potential and beneficial impact on scientists' mode of working of such tools.

This section (and Table I) is likely to be out of date before the end of 1979 as new micrographic, word processing, and operational facilities become available or economic to consider, as this area is continuously and rapidly developing.

## 7. SUMMARY

The micrographics system for archiving and micropublishing ARRB documentary and graphic material has been specified. The information data capture, manipulation, and output context within which it operates has been described showing how the wide range of facilities within and without ARRC can be effectively used, and in many cases reduce the effort and time required to record, retrieve, or reproduce ARRB materials.

Report written by: Alamsy Nigh

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9.1 APPENDIX A

9.2 APPENDIX B

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TYPE SIZE (This paragraph has been done in 12 point) As a rule of thumb, the size of input type should always measure at least one percent of the longest dimension of your input material. e.g. If input is on an A4 size sheet, your type should be no less than 1/8th of an inch high (12 point).

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