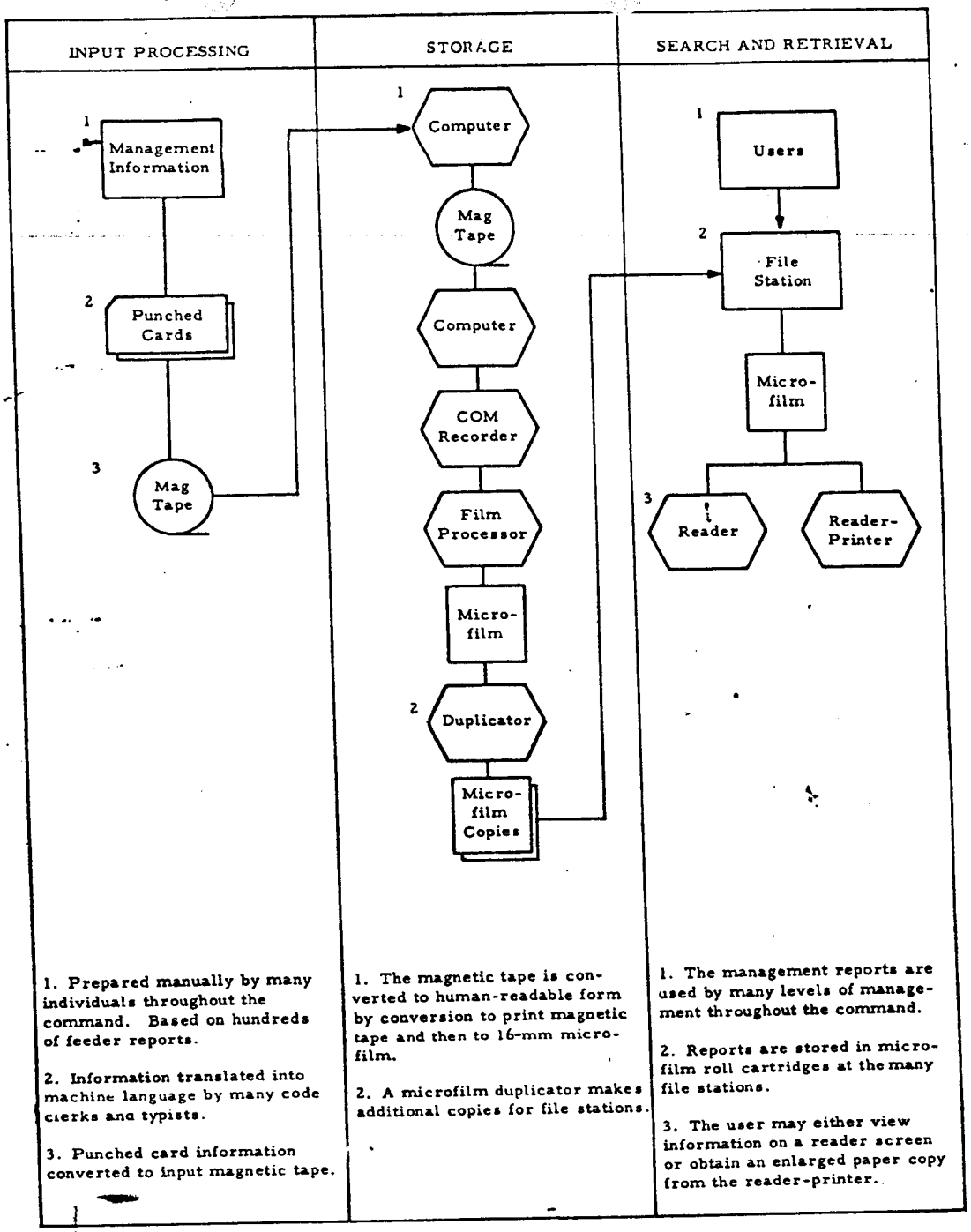
Considerable savings in paper will accrue since many users of the management reports are only interested in a small segment of the full report. Hence, the system can be tailored to the needs of individual users through selective storage of microfilm cartridge information at the file stations. When the six duplicate systems are fully operational, more than two tons of computer printout paper will be eliminated annually.

Other significant benefits will be realized through the conversion of about 34 million pages of printed paper files to microfilm, including easier storage and handling and increased efficiency for users.

Service tests revealed that the majority of users desired their information on microfilm rather than on paper printouts. However, some negative reaction concerned two aspects of the microfilm reading equipment—design and environment. Some users experienced discomfort such as eyestrain, headache, and neckstrain. To modify or eliminate these problems, system specifications will acknowledge the need for less screen glare on readers and a more compatible lighting environment. Additionally, the acquisition of adjustable-height stands for readout equipment will be considered.

MIN TURIZED MANAGEMENT REPORTS STRIBUTION



NAME OF SYSTEM:

Office Files Coordinate Index

ORIGINATOR:

Office of Scientific and Technical Information

Office of Aerospace Research

Department of the Air Force, Washington, D.C. 20330

OBJECTIVE. To evaluate several nonconventional document reference systems, with a view toward implementing the method that shows the best promise of improving office-level document identification and retrieval processes.

BACKGROUND. The Office of Aerospace Research is a separate operating agency answering directly to the Headquarters, United States Air Force. It conducts and supports research relating to the Air Force's operational capabilities. It can therefore be seen that the proper handling of office correspondence and technical documents is most important to the overall effectiveness of this organization. Its scientifically-oriented document collection mainly includes professional papers, technical reports and proposals, and journal articles on research matters.

The conventional hierarchical subject classification system was not particularly well suited to the needs of the office, and therefore it was decided to explore other techniques for organizing the files. It was concluded that a rather simple nonconventional coordinate indexing system would satisfy this goal. It was further decided to attempt to use regular office personnel to operate the system, although systems of this type customarily employ professional indexers. To determine the feasibility of this, a period of on-the-job evaluation of coordinate indexing methods was conducted using available office personnel—clerks, stenographers, and secretaries—to perform all tasks. The test was successful, and the Office of Scientific and Technical Information established a columnar card, coordinate indexing system on a permanent basis.

THE NEW METHOD. The physical elements of this columnar card system consists of an overprinted 5 x 8 inch index card and a loose-leaf binder containing a vocabulary of commonly used words (indexing terms). The columnar index cards, called word-cards, contain ten vertical columns numbered consecutively from 0 to 9 for use in entering the numbers of the accessioned documents. The last digit of the document's number determines the column to which that number is posted. The only purpose of the columnar format is to assist in scanning for identical document numbers. The vocabulary is a form of translation dictionary that contains words commonly known and frequently used in correspondence or by searchers in describing desired correspondence, with cross references for synonyms. A word-card is placed in the card file for each authorized indexing term contained in the vocabulary.

The input processing sequence is relatively easy to learn, and in the case of this system is usually performed by an office secretary. Each incoming document is first reviewed to determine whether it should be accessioned or discarded. If retained, it is assigned a document number. It is then scanned or read to identify key terms. The key terms thus selected are checked against the approved vocabulary word-list to determine, in each instance, what term should be used for actual indexing purposes. The columnar word-cards representing these approved terms are then withdrawn from the card file and posted to show the newly accessioned document's identity number. The document is then placed in the serially numbered document file and the columnar word-cards are returned to their alphabetical position in their file.

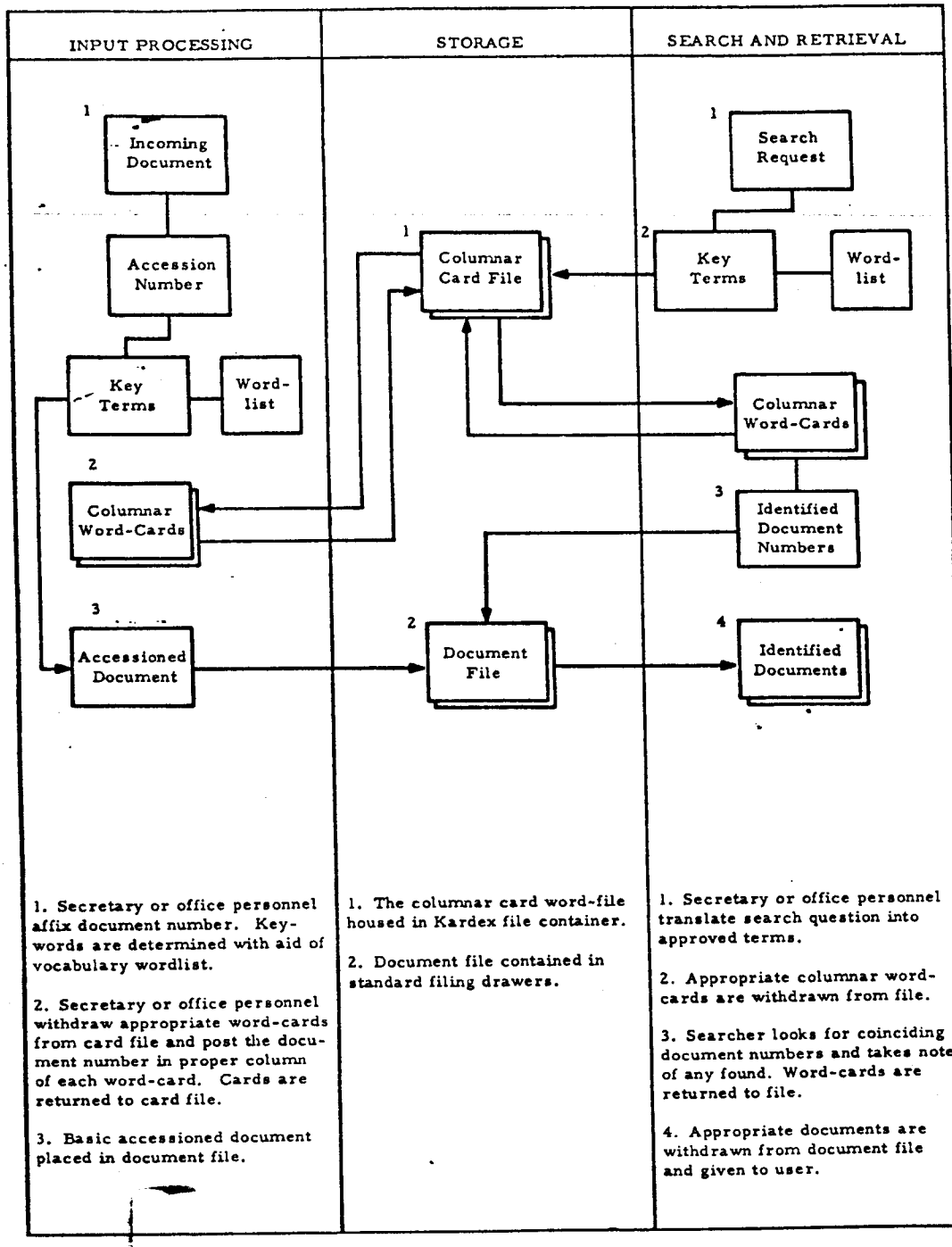
In the retrieval process, a secretary is usually given several descriptive words pertaining to the document sought by the user. Through use of the vocabulary word-list, she translates those initial words, where necessary, into the actual indexing terms used in the system. She withdraws the cards representing these terms from the columnar word-card file and compares document numbers on

all cards, column- column, for coinciding document numbers. The material thus identified is withdrawn from the document file and given to the requester.

REMARKS. This columnar card, coordinate indexing system well serves the objectives of the sponsoring office. The method represents the simplest and least expensive of the nonconventional reference systems in terms of eq nent and maintenance costs. In this particular situation, regularly assigned office personnel were able to quickly learn the principles and procedures required to handle and index office correspondence.

With proper planning, conversion from a conventional, multisubject filing system to a coordinate system of this type can be accomplished with little disruption in day-to-day operational effectiveness.

OFFICE FILES COORDINATE INDEX



NAME OF SYSTEM:

Technical Data Dissemination and Retrieval

ORIGINATOR:

Warner Robins Air Material Area
Air Force Logistic Command
Department of the Air Force
Robins Air Force Base,
Georgia 31093

OBJECTIVE. To evaluate and implement a microform image storage and retrieval system that will more effectively serve the technical data needs of maintenance technician personnel.

BACKGROUND. Warner Robins Air Material Area (WRAMA) is one of five logistic facilities within the Air Force that provides material support to its operating units throughout the world. This support encompasses such activities as supply, material maintenance, and procurement. WRAMA specifically is responsible for the logistic management of a variety of component systems such as tactical missiles, helicopters, and small aircraft.

Because of the technical nature of this mission large quantities of instructional material are produced. For example, the organization's technical data system contains about seven million pages of instructions, which are contained in 70,000 publications. During an average year more than two million page changes to the basic instructions are necessary to keep the information current. To maintain this data in reasonable order, 90 file areas or stations are located throughout the base complex of work areas that service particular types of material.

Success of WRAMA's maintenance mission is dependent upon accurate, complete, and current technical data. A study of the growing problem isolated three main areas of concern. These were the lack of technical manual file integrity, the failure to provide data in a form convenient to the user, and the high cost of maintaining files. File integrity was found to be the most serious deficiency. Requisitions were often backordered, mail was frequently delayed, and revisions were sometimes not received or were misplaced. Obsolete instructional data delayed technicians in accomplishing maintenance task assignments while awaiting receipt of a current directive.

As a result of these findings, in early 1969 WRAMA conducted a 4-month service test with 400 individuals to evaluate the feasibility of employing microform to eliminate the deficiencies. The test conclusions showed that "microfilming of technical data should prove highly beneficial in all areas, including cost reduction." As a result, WRAMA is currently expanding the use of microfilm to other work areas. Because of the magnitude and operational impact of this undertaking, full conversion will not be completed for several years.

THE NEW METHOD. Technical data material, in page form, is arranged sequentially for recording on 16-mm. microfilm by a Recordak 600-K microfilmer. The film is developed in a Recordak Prostar processor, and diazo negative roll copies are then produced on a CBS (Columbia Broadcasting Company) continuous film duplicator. The microfilm is cut into 100-foot lengths and loaded into cartridges intended for use with the 3M 400-C microfilm reader-printer. The cartridges are indexed and labeled to show the segment of the technical data material each contains.

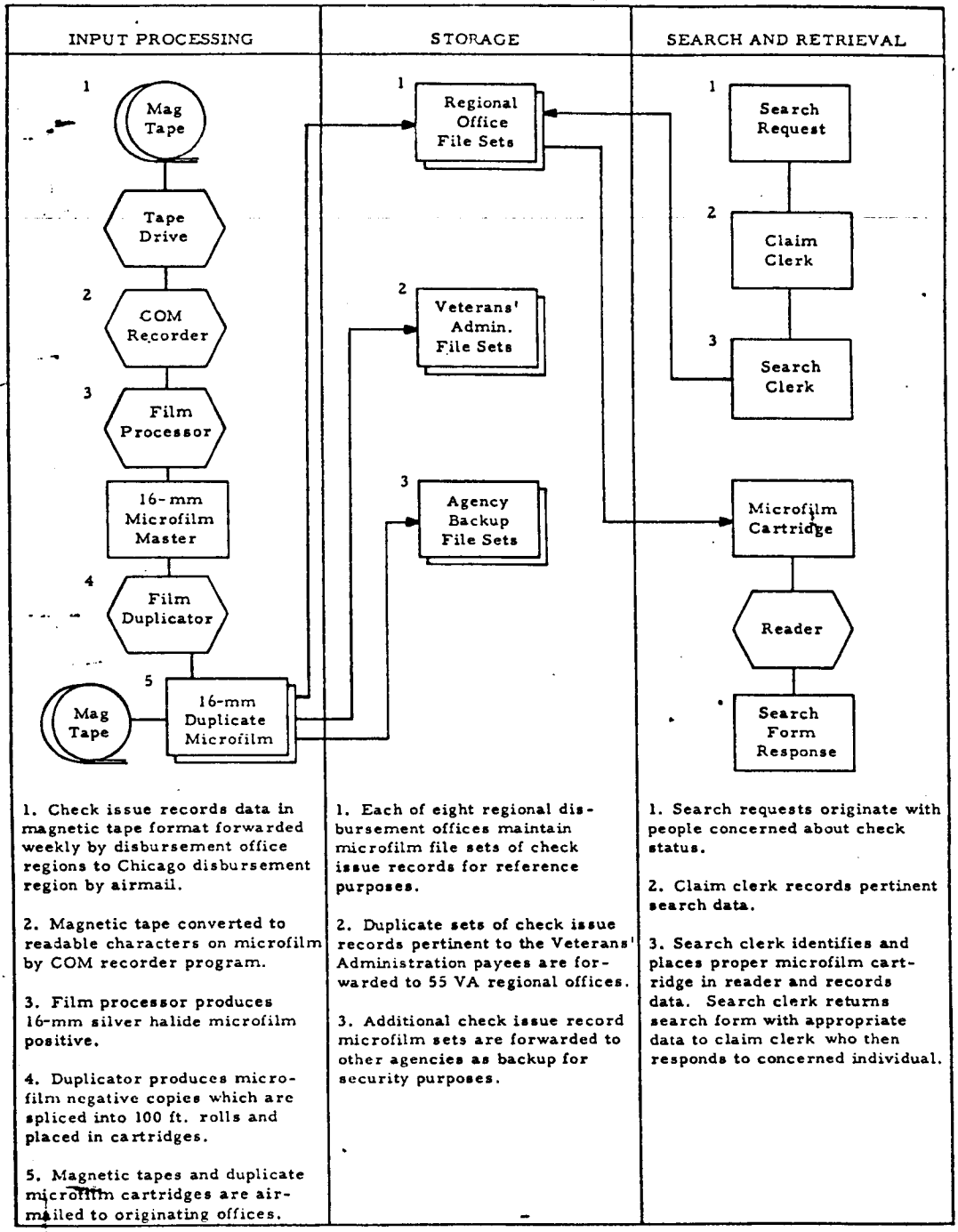
Cartridges are distributed to work area file stations, and upon receipt the obsolete cartridges are returned to the data manager's office. Revision data cycles average 45 to 60 days and depend upon the data change frequency within a particular type or class of material data.

The mechanic or other interested individual has the option of viewing page image data on a reader or of obtaining an enlarged paper copy for use at his work location. Battery-powered portable readers are available for use at remote sites such as engine run-up

facilities and area suppo[illegible]ites. Image finding is accomplished by the odometer technique wherein individual images are manually located on the viewer on the basis of their linear location on the roll.

REMARKS. The primary advantage of the use of the microform rather than manual means of technical data display is the concept of one data manager being responsible for a given set of microfilm data cartridges. The responsibility for [illegible]dating the master data package, for assuring that data is current and complete prior to filming, for reviewing the master film and duplicates, and for distributing required cartridges rests with one individual. This concept provides a single contact between material class managers and various users of the data and proves most beneficial to file integrity. Data integrity is further enhanced by the system's ability to cut reaction time to data changes by about one-half.

ECHNICAL DATA DISSEMINATION A RETRIEVAL



1. Check issue records data in magnetic tape format forwarded weekly by disbursement office regions to Chicago disbursement region by airmail.

2. Magnetic tape converted to readable characters on microfilm by COM recorder program.

3. Film processor produces 16-mm silver halide microfilm positive.

4. Duplicator produces microfilm negative copies which are spliced into 100 ft. rolls and placed in cartridges.

5. Magnetic tapes and duplicate microfilm cartridges are airmailed to originating offices.

1. Each of eight regional disbursement offices maintain microfilm file sets of check issue records for reference purposes.

2. Duplicate sets of check issue records pertinent to the Veterans' Administration payees are forwarded to 55 VA regional offices.

3. Additional check issue record microfilm sets are forwarded to other agencies as backup for security purposes.

1. Search requests originate with people concerned about check status.

2. Claim clerk records pertinent search data.

3. Search clerk identifies and places proper microfilm cartridge in reader and records data. Search clerk returns search form with appropriate data to claim clerk who then responds to concerned individual.

NAME OF SYSTEM:

Microform Engineering Drawings Support

ORIGINATOR:

Marine Corps Supply Activity
United States Marine Corps
Philadelphia, Penna. 19146

OBJECTIVE. To provide a microfilm system that will effectively support the inventory control and procurement functions of the Marine Corps Supply Activity.

BACKGROUND. The Marine Corp's Supply Activity at Philadelphia has been providing logistic support for the Corps since Thomas Jefferson's administration. Although certain supply and logistics services (especially catalog standardization), have been transferred to the Defense Supply Agency, the military services manage material and support items peculiar to their individual needs. Thus, the services develop their requirements, arrange for the procurement of specified material and supply items, and insure that adequate inventory levels are maintained to meet projected usage. The Supply Activity at Philadelphia performs this vital function for the Marine Corps.

Among its many diverse duties, the Inventory Management Activity is responsible for maintaining a library of technical reference information on material and supply items used by the Corps. Engineering drawings form an important link in this management process and serve as a focal point for the provisioning, cataloging, and procuring activities. As new items enter the inventory for the first time, the contractor furnishes appropriate engineering drawings for use in the provisioning and cataloging process. Later, when subsequent invitations to bid are required, sets of pertinent drawings support the procurement process.

For many years, drawings used for procurement actions were reproduced in hard copy paper form and in many different sizes. As specifications for new items became more complex, the supporting drawings necessarily increased in number. Further, broad interest in some procurement actions created the need for multiple bid sets. These developments, plus the increase in space needed to house the drawings inventory, precluded any early, satisfactory solution.

The space problem was eliminated with the conversion of the engineering drawing inventory to aperture card format. However, bid sets in support of procurement actions continued to contain reproduced paper enlargements of aperture card engineering drawing images and slowed down the processing action.

As the use of aperture cards and associated equipment increased throughout industry, the inventory management activity has expanded the use of microform to all phases of the engineering drawing operation.

THE NEW METHOD. The improved system is designed particularly to improve the reaction time in procurement actions. Manufacturers' inputs to the system consist of both full-size paper copies of engineering drawings and aperture cards, as provided in the contract. The Defense Supply Agency (DSA) furnishes aperture cards in the standardized format with prepunched identification codes.

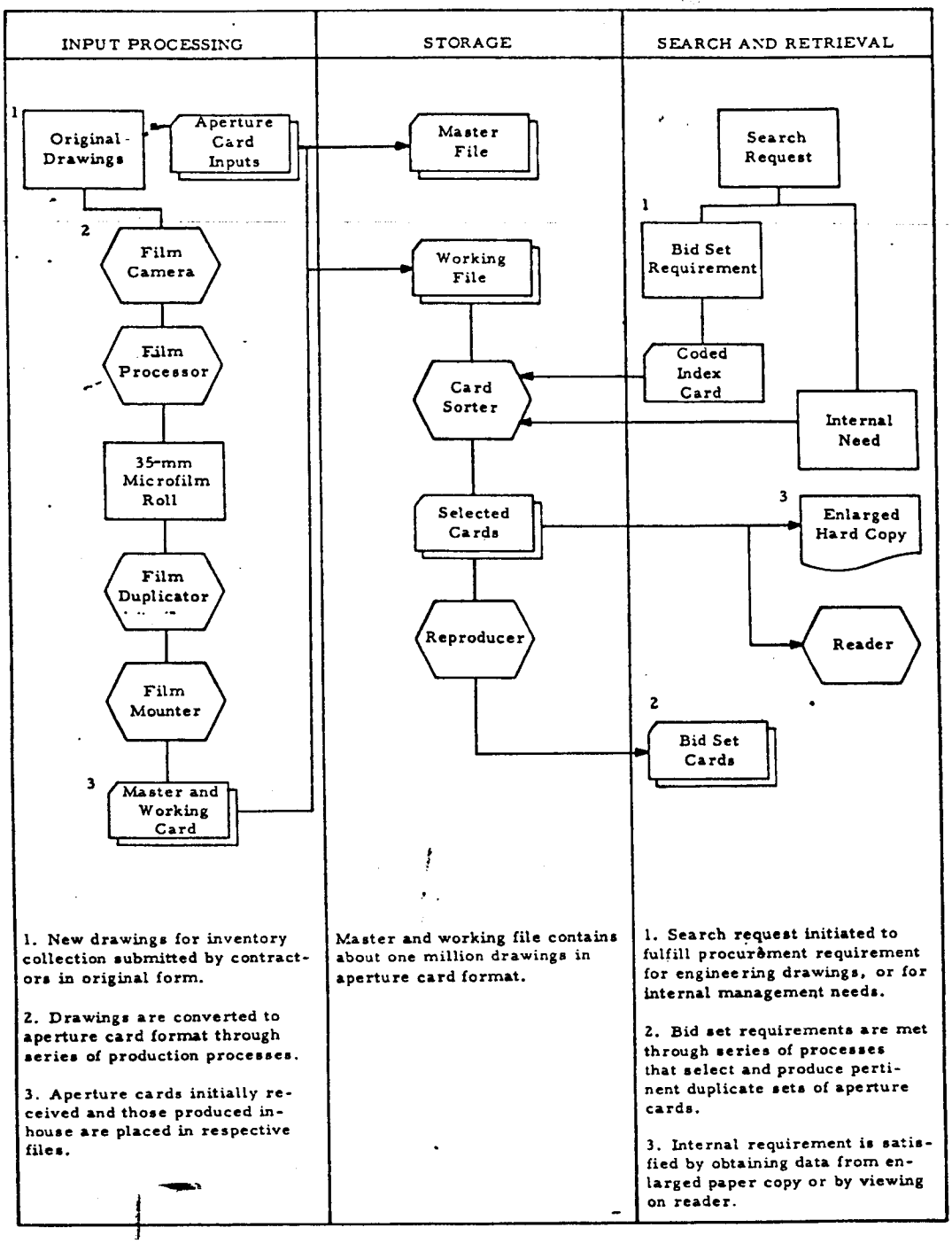
Drawings received in paper format are sorted into compatible sizes and recorded on 35-mm. microfilm. The exposed film is developed in a microfilm processor, with a Uniprinter used to make duplicate negatives. Both manual and semimanual devices are employed to mount the individual frames in the coded aperture cards, which are keypunched to permit machine sorting and other manipulations. The keypunch coding includes the standard engineering drawing number and the manufacturer's five digit identity, which facilitates interchange of filmed drawings with other agencies. Duplicate microfilm positives are used in the working file with the original negatives preserved as the master file.

The present collection numbers about one million cards housed in conventional upright file cabinets. To satisfy bid set requirements, a machine sorting program using coded index cards identifies the aperture card drawings pertinent to a procurement action. The selected working aperture cards are then duplicated on a 041 card-to-card reproducer and verified for accuracy. The working cards are returned to the file and the reproduced cards are enclosed in the total procurement package and mailed to prospective bidders.

Internal searches, usually at the request of technicians, deal with maintenance, provisioning, and cataloging matters and may require working size hard copy printouts, which are produced on an enlarger-printer. In other instances, technicians may wish to study the data by means of an enlarged image on a viewer.

REMARKS. The use of microform in aperture card format has contributed significantly to the faster and more economical methods of satisfying both internal and external requirements of the Marine Corps Supply Activity. The system illustrates the space saving advantages as well as the flexibility and convenience of collecting, packaging, and shipping large numbers of engineering drawings—often on a limited time schedule.

MICROFORM ENGINEERING DRAWINGS SUPPORT



NAME OF SYSTEM:

DDC Information Storage, Dissemination, and Retrieval

ORIGINATOR:

Defense Documentation Center (DDC)

Defense Supply Agency

Cameron Station,
Alexandria, Virginia 22314

OBJECTIVE. To maintain and operate a centralized national documentation dissemination and retrieval service for the scientific and engineering disciplines, in order to improve the utilization of research reports and the effectiveness of Government research and development activities.

BACKGROUND. The Defense Department (DOD) must spend several billion dollars a year on research, development, testing, and evaluation of new operational and support systems. As a by-product of these thousands of individual programs, an avalanche of technical reports are produced. Collectively, there is a treasure of scientific and technical information among these many documents. A major problem in the design of any information collecting, processing, and disseminating system is the need to channel the required information to the interested persons as efficiently and effectively as possible.

To better understand user characteristics, the DOD undertook a comprehensive study of the problem by interviewing many users of the information. The sampling encompassed about 1,350 of the more than 100,000 scientists, engineers, and technical people involved in Department of Defense research and development work. The investigation revealed that, as for type of information interest, almost half desired engineering information while about 40 percent had scientifically-oriented interests. In regard to the depth of the information need, 60 percent wished specific facts, perhaps from one document, while about a third of those interviewed desired enough material to make detailed analyses.

In terms of information system utilization, about 95 percent of the users relied upon their organizational technical libraries, with most agreeing that abstracts of information media would have been useful in completing past projects. About one third of the users utilized the DDC, while the remainder, at the time of the interview, were unaware of its services.

THE NEW METHOD. The Defense Documentation Center collects, processes, announces, and distributes scientific, engineering, and technical information to personnel of the Department of Defense and related agencies and activities. Documents processed and distributed by this system fall into the subject categories listed in the COSATI (Committee on Scientific and Technical Information) Subject Category List, which covers 22 scientific and engineering fields.

The full collection of research and development documents dates from 1947 and totals about one million accessions. The descriptive data for accessions acquired since 1953 is stored on magnetic tape and is computer-retrievable. All documents are microfilmed as they are processed into the system. Those documents received before 1965 are stored on 35-mm. roll microfilm while the later acquisitions are reproduced in microfiche. The microfiche is used to reproduce hard copies for prestocking and to meet user needs. Incoming documents are arranged by a six digit AD number in consecutive order within three separate blocks of numbers, which are based on classification needs.

Document analysis processing includes descriptive cataloging, subject categorization, subject indexing, and abstracting, which is accomplished by means of remote input terminals. The objective of this treatment is to bring the technical report literature under bibliographic control and to simultaneously produce input data for processing into the computer record.

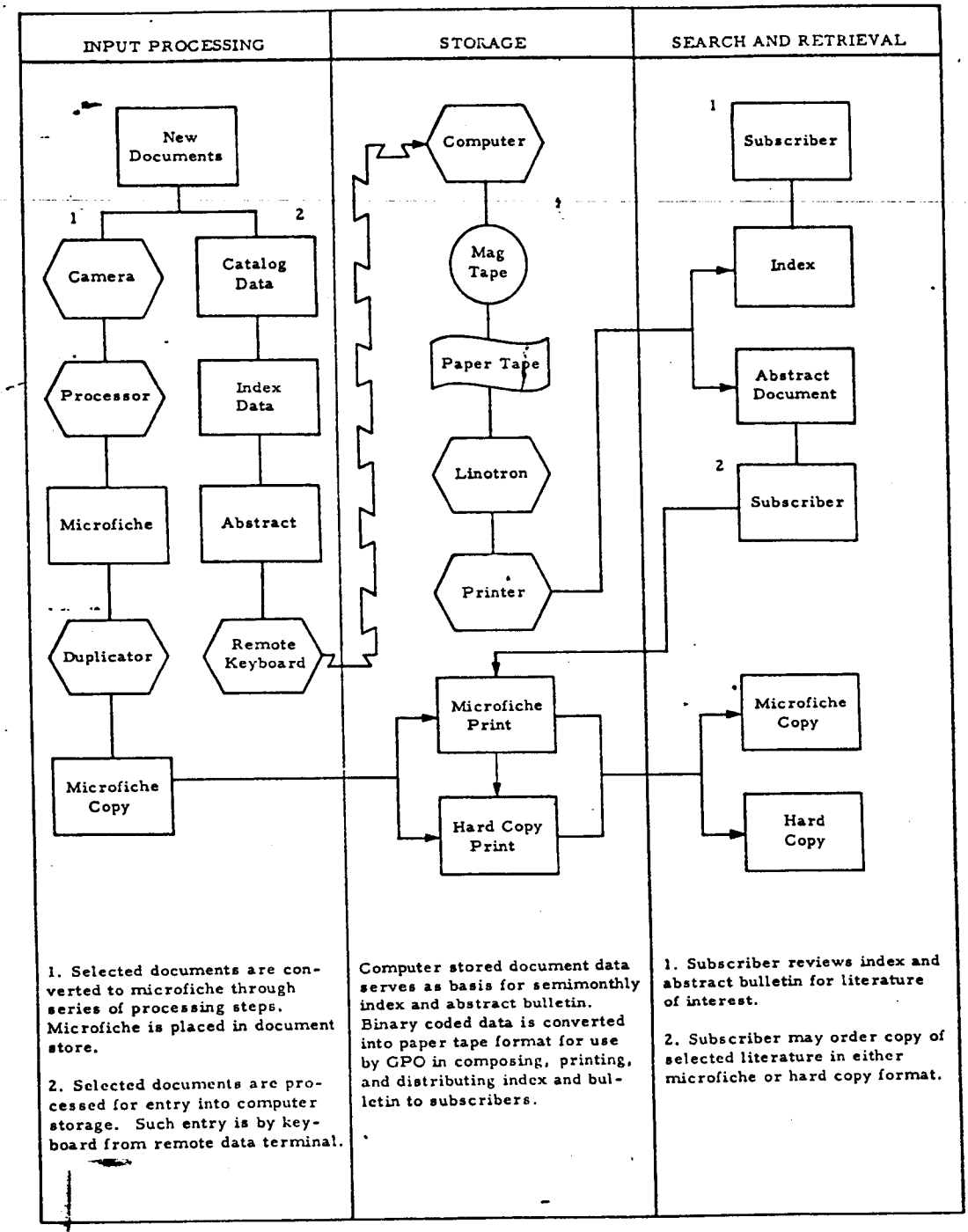
Documents are categorized under as many as 13 characteristics that are machine-stored for subsequent retrieval. Characteristics include corporate author entry, personal author, and the source report number.

The Technical Abstract Bulletin (TAB), together with its companion TAB indexes, are published semimonthly and announce new accessions to a limited group of users. Should these subscribers desire a copy of the document they may choose between hard copy or microfiche format. (By special arrangement, DDC will furnish magnetic tape containing cataloging data covering current accessions.)

REMARKS. The objective of this system is to provide the right information to the user at the right time and in an economically acceptable format. It is the largest and the most used system of its kind anywhere in the world. A first step in meeting these responsibilities is to understand users' needs and then to establish procedures that will fulfill their requirements.

DDC is continuing to take actions within the processing framework to reduce the time for document information to reach users. For example, during the past year the time span between initial receipt of documents by the DDC and the receipt of abstracts and indexes by subscribers has been greatly reduced. This improvement resulted from the installation of new electronic photocomposition equipment at the Government Printing Office (GPO) and from the cooperative efforts of the GPO and the DDC to fully utilize the equipment's productive capabilities.

DDC INFORMATION STORAGE, DISSEMINATION, AND RETRIEVAL



NAME OF SYSTEM:

Medical Record Storage

ORIGINATOR:

Armed Forces Institute of Pathology
6826 16th Street,
Washington, D.C. 20012

OBJECTIVE. To develop a document storage system that will reduce the total space committed to the Institute's voluminous medical history case file and to improve the overall efficiency of the document handling function.

BACKGROUND. The Armed Forces Institute of Pathology is responsible for basic research in all areas of pathology. Over the years it has accumulated a medical history case file containing over one million cases from all parts of the world. New case material is received daily while many onhand cases continue to remain active and to require periodic updating actions. This continuing document file expansion created space problems and reduced search effectiveness. To better insure that the professional staff's document needs are properly met and that individual patient's records can be made simultaneously available to more than one user, a study group recommended adoption of a microfilm jacket method to solve the space and document retrieval problem.

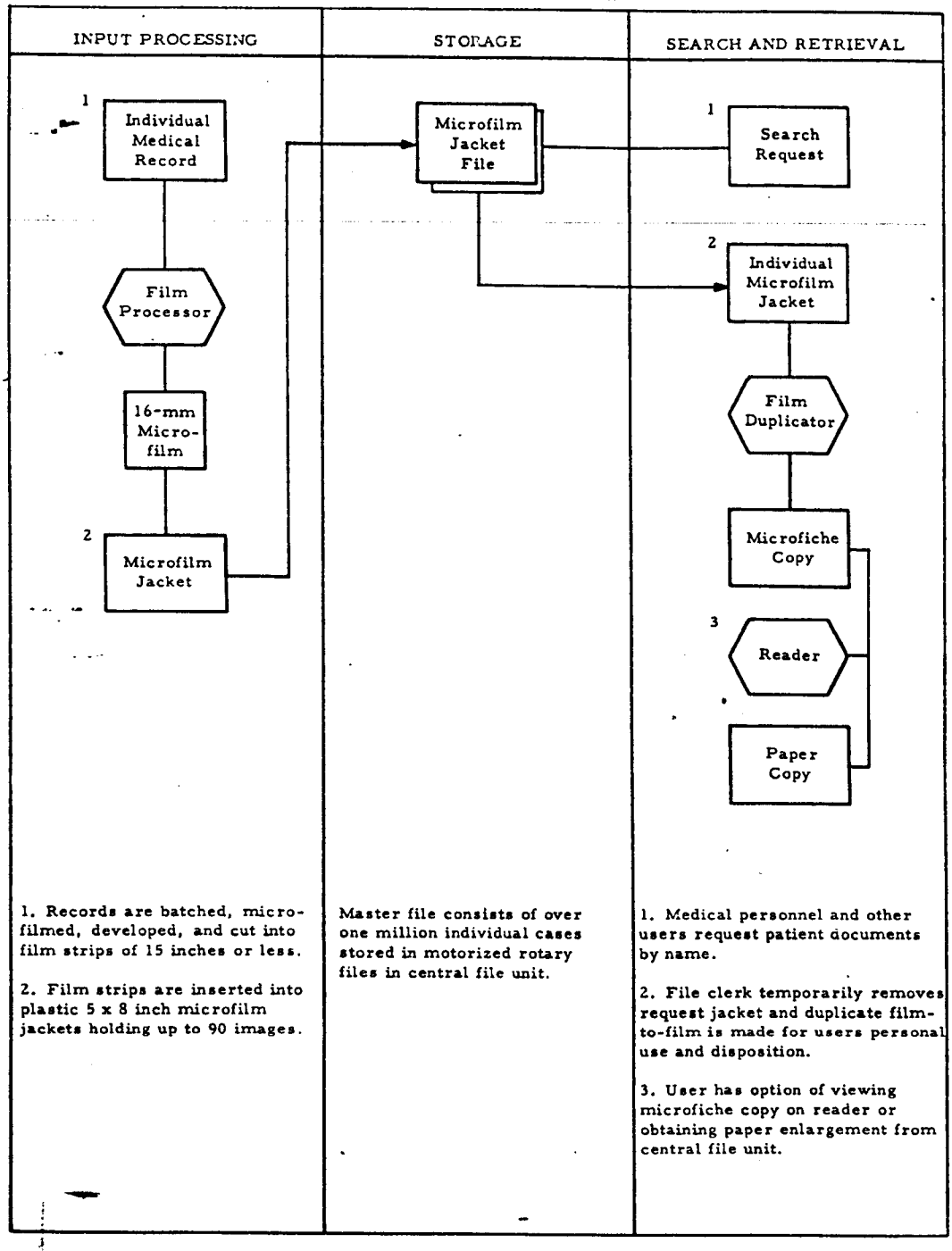
THE NEW METHOD. The first action in converting to the microfilm jacket system consisted of screening the patient medical records, arranging the papers in chronological order, and preparing a log sheet. These medical history documents included such matter as typed reports, charts, graphs, and forms. After other minor actions to insure proper order and control over individual patient records, the documents were microfilmed on a portable, rotary type microfilm camera. After developing, the exposed film was inspected, cut, and inserted into the microfilm jacket slots in a single operation. A special device enables the operator to semi-automatically insert from one to as many as 15 page images in one operation. This insertion technique permits new documents to be added to a patient's jacket record after each period of hospitalization or treatment.

The microfilm jacket used by the Institute is transparent and measures 5 x 8 inches. It is formed by joining two sheets of plastic to provide six rows of horizontal slots for inserting up to 15 image strips of roll microfilm per slot. Each jacket may thus hold up to 90 images with additional jackets established when a patient's record exceeds 90 pages. An opaque stripe is provided on the top of each jacket for showing identifying data in normal size print, and the jackets are maintained in paper folders for ease of withdrawal from the file and for control purposes.

The microfilm jackets are stored in motorized rotary files. When a researcher wishes to retrieve a particular patient's records, the appropriate jacket is temporarily removed from the file, and a duplicate microfiche copy is made for his personal use and disposition. The doctors and other professional people view the filmed images on a microfilm reader located in their individual work areas. The user may position the jacket in the reader through use of control knobs and identification markings. Whenever desired, a paper enlargement of a particular image is made by the central file unit and sent to the user.

REMARKS. The conversion of the former large and bulky conventional document storage system to this miniaturized Medical Record Storage System has resulted in numerous benefits, such as the great reduction in space committed to document storage; the preservation of valuable records and improvement in control over the document files due to the fact that the master film record never leaves the control unit; the relatively easy method of adding new material to the established jacket file; and the capability for making individual patient's records available to more than one user at the same time.

MEDICAL RECORD STORA



NAME OF SYSTEM:

ERIC (Educational Resources Information Center)

ORIGINATOR:

National Center for Educational Research and Development

Office of Education

Department of Health, Education, and Welfare

Washington, D.C. 20202

OBJECTIVE. To make current educational research and related information available promptly and inexpensively to teachers, administrators, researchers, and public officials, and business and industry groups.

BACKGROUND. The overall responsibility of the Office of Education is to collect and disseminate such statistics and facts as shall promote the cause of education within the United States. Within this framework, the Bureau of Research collects and distributes educational research documents to interested educational personnel. To administer this activity, the Office of Education established the Educational Resources Information Center—ERIC. The field of potential information users is broadly based and includes local school districts, colleges, State governments, boards of education, and others involved in educational activities.

THE NEW METHOD. The task of acquiring the significant research material is performed by 20 regional educational information clearing houses that are generally located at universities and regional educational laboratories. All acquired research reports that have catalog listing potential are screened by the clearing houses to insure that all subject matter meets established standards. Selected reports are documented on a special resume or abstract form containing information on specific indexing terms and document identifications.

At Washington, D.C., computer programs permit the monthly field submissions in paper tape format to be quickly machine processed. The resultant product is a computer printout that serves as the basis for the monthly catalog. The contents of the catalog include a list of article titles, the identification numbers, indexes, and a numerical listing of abstract identifications. This comprehensive collection of referenced accessions is then distributed to the many subscribers throughout the country. A copy of any report listed in the catalog may be purchased for a nominal cost from the ERIC Document Reproduction Service, which is operated by a private contractor.

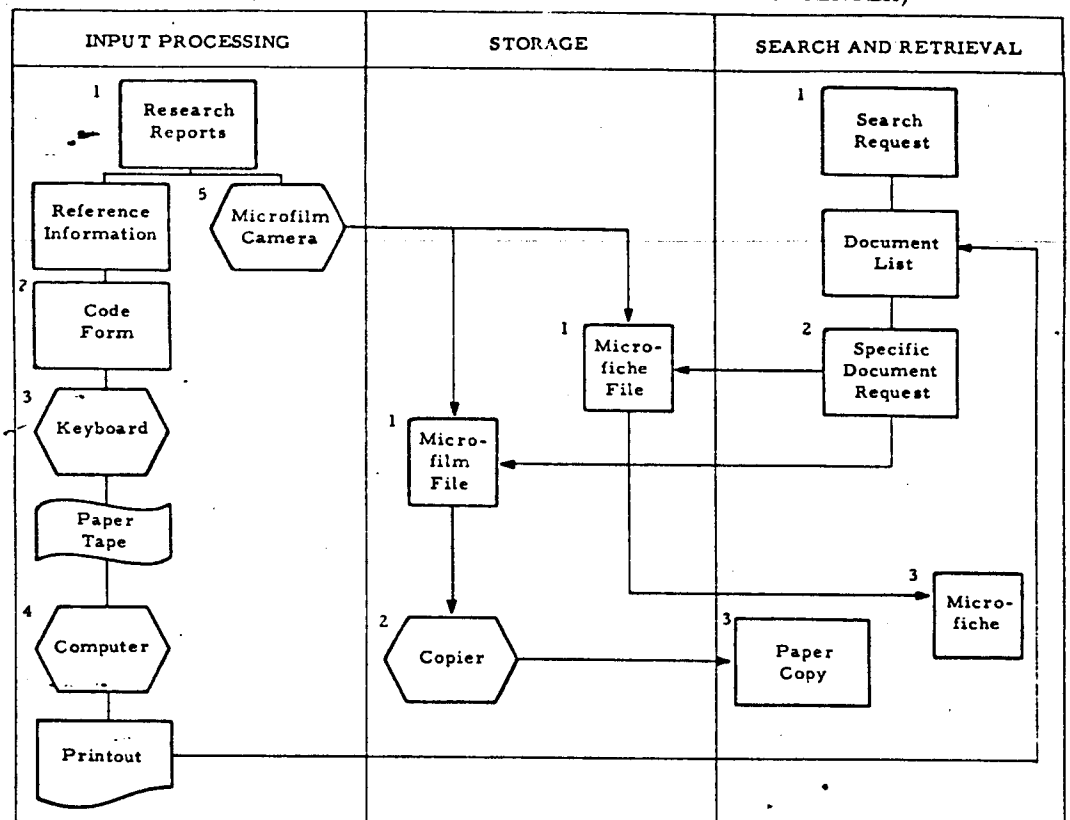
At the contractor facility, the monthly accessions are reduced to the COSATI (Committee on Scientific and Technical Information) microfiche format using a special step and repeat camera. The first 4 x 6 inch microfiche of any individual document may contain up to 60 page images and the second and subsequent microfiche, 72 page images. The form has space reserved at the top for essential identifying data in normal size print.

The subscribing users of the service identify desired research reports by looking through the catalog. Those subscribers wishing to order complete copies of research papers have the choice of two formats: an inexpensive microfiche for those who have access to a microfiche reader or a 6 x 8 inch enlarged paper copy, available at a higher cost.

REMARKS. The ERIC system is a most economical method for storing, retrieving, and disseminating full-page reproductions. This is especially true in instances where the documents to be distributed are already in print when received and where there is a very large user base, since copy reproduction costs are less expensive than other methods. The economy of storage at the user location is also apparent. Further, copies can be readily reproduced on demand by either the central or the user facility, making it unnecessary to maintain any stock. Last, packaging and shipment costs are held to a minimum.

The ERIC program is currently reaching an estimated 477,000 educators each month, and during 1969 about 10 million microfiche were sold by the ERIC Document Reproduction Service.

ERIC (EDUCATIONAL RESOURCES INFORMATION CENTER)



1. Regional clearing houses select and accession proper reports.

2. Clerk converts appropriate information into code form.

3. Operator transforms information into punched paper tape format.

4. Special computer program converts information into printout listing of references.

5. Original reports are forwarded to Bethesda, Maryland and converted into microfilm and microfiche with step and repeat camera.

1. Research information is stored on microfilm and microfiche at the Bethesda, Maryland facility.

2. The facility forwards subscribers information requested in either microfiche or paper copy format.

1. Subscribers search document list for desired articles.

2. Subscribers order items from Bethesda facility by reference number and format.

3. Information is received in desired format.

NAME OF SYSTEM:

Beneficiary Information

ORIGINATOR:

Bureau of District Office Operations
Social Security Administration,
Baltimore, Maryland 21235

OBJECTIVE. To design and place into operation an integrated document retrieval system that will enable the District Offices to provide the public with more accurate, timely, and useful beneficiary information.

BACKGROUND. The Bureau of District Office Operations provides direction to the nationwide network of district and branch offices that serve as the intermediary between the Social Security Administration and the public. Among its many responsibilities is that of providing information to people about beneficiary matters.

For years the district and branch offices administering the Social Security program have had difficulty in responding satisfactorily to the millions of annual inquiries. The growing accumulation of records, together with an increased public awareness about the various entitlements of the programs, has made the answering of questions increasingly difficult. There had been an urgent need for designing a system that would assure that records used in beneficiary interviews were both current and accurate.

Fortunately, during the 1960's the district and branch offices gained much experience in the use of a microfilm retrieval system for handling health insurance inquiries. It was the consensus of those most concerned with the beneficiary information problem that better response to the public would occur only with the design and implementation of a microform system. Accordingly, the decision was made to condense the beneficiary data kept on magnetic tape in Baltimore and to record this data on microfilm. It was further decided that microfiche rather than roll film would be used for the following reasons: the updating is less costly, the shipping problems are less difficult; the look-up time is shorter; the filing sequence is less cumbersome; the reader-printer machine is less expensive.

THE NEW METHOD. The Beneficiary Information System consists of selected information recorded on microfiche. Selected data for 600 accounts is displayed on 4 x 6 inch microfiche cards. (This capacity contrasts with the normal 4 feet of microfilm roll needed for the same number of accounts in the old system.) Each microfiche has 72 frames of beneficiary information arranged into nine columns of eight horizontal rows, with individual frames containing from six to nine accounts. At the top of each microfiche is a header that shows the range of names in normal size print. Additionally, there is an index that shows the x-y coordinate location of records within each frame.

The conversion of the digital input magnetic tape information to the master or orginal fiche format is performed by the Bureau of Data Processing and Accounts. A Stromberg-DatagraphiX 4440 COM (computer output microfilm) recording and developing system is used for this purpose. This special camera records beneficiary data from the magnetic tape on 4-inch wide film at the rate of two to three microfiche per minute, or 1,200 to 1,800 records per minute. The data is reduced on film at a 25 to 1 ratio. The original records are recorded on silver halide roll film, developed as positives, and duplicated on Kalvar negative copies. These copies are then automatically cut into 4 x 6 inch microfiche.

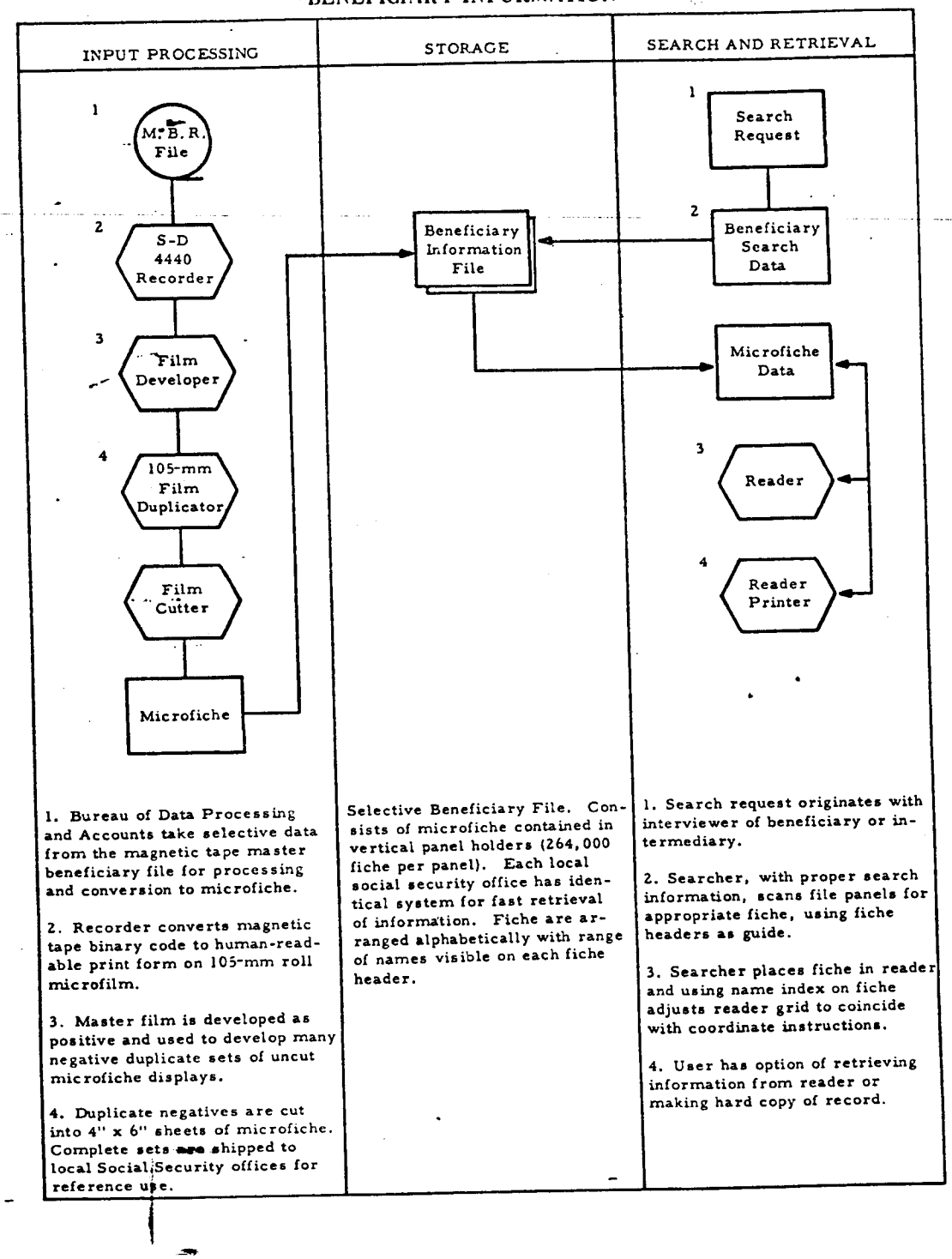
The file is arranged alphabetically by name of the principal beneficiary and contains such information as other beneficiaries, social security numbers, certain historical information, and annual contribution data. The microfiche are filed in an upright metal stand holding a maximum of four or five two-sided panels. Panels are 24 inches high and 18 inches wide, with space for 440 microfiche arranged in three vertical rows. In total, a single panel may contain 264,000 individual records. The microfiche header information is readily identifiable from the file position,

and when a microfiche is removed from the file the background becomes an automatic "charge-out." The microfiche reader contains an x-y grid system corresponding to the grid identification index recorded on each microfiche. With this finding technique, most searches can be completed within 20 seconds.

In the retrieval process, the microfiche file and the reader-printer are usually located in close proximity to the work area of the user-interviewer. Copies of beneficiary records are thus available for viewing or copying in a minimum of time.

REMARKS. This Beneficiary Information System is a classic example of large masses of magnetic tape stored data that is made readily accessible by conversion to a microform format through use of COM equipment. In this instance, the data is made available to 1,000 locations around the Nation. The system utilizes to the fullest the microform characteristics of compactness, convenience of shipment, and economy of storage and retrieval. Additionally, in the case of microfiche, the cost of the semiannual updating of the complete file is quite economical in comparison with other document storage and retrieval methods. The total file of 26 million beneficiary records is contained on about 49,000 silver halide microfiche (originals or masters) at Baltimore. The duplicates forwarded to the nearly 1,000 local Social Security offices number approximately 1.5 million.

BENEFICIARY INFORMATION



NAME OF SYSTEM:

National Employee Account Card Holders

ORIGINATOR:

Division of Accounting Operations

Bureau of Retirement & Survivors Insurance

Social Security Administration,

Baltimore, Maryland 21235

OBJECTIVE. To improve this large document storage and retrieval operation through use of updated methods and equipment in order to greatly reduce total space requirements and provide for improved retrieval techniques.

BACKGROUND. The Social Security Administration administers the Federal retirement, survivors, disability, and health insurance programs as authorized by the Social Security Act. The Division of Accounting Operations supports the overall program by maintaining a "National Employee Index of Account Card Holders." This index contains the names, dates of birth, and social security account numbers of more than 200 million past and present social security registrants. The index is used in the processing of social security applications and requests for social security numbers.

Until 1958, social security card name identifications were contained on individually printed strips mounted on vertical panels holding about 145 names each. The file was arranged by soundex code, which uses a combination of four alpha-numeric characters to represent the individual's last name; that is, the first letter of the last name is followed by three numerical code digits representing the three or less consonant sounds contained in the remaining letters of the name. Identification elements following the soundex code are the full last and first name, middle initial, birth date, and social security number. The magnitude of the file and search operation was astronomical. The millions of name entries required 1.3 million panels, and each year about 50,000 additional panels were needed for new entries.

THE NEW METHOD. The new system is based on use of mechanized roll microfilm. An initial index conversion technique resolved the usual difficulty of efficiently handling the frequent changes made to roll microfilm. The solution consisted of dividing the 100-foot rolls, each having a capacity of 2,000 microfilm image panels, into two segments. The first segment represents about 1,300 film images of the actual flexoline panels used prior to 1958. The second segment, about ⅓ of each roll, consists of cumulative monthly additions and changes. The latter segment of microfilm is discarded each month and an updated, cumulative change segment is spliced onto each reel.

The monthly updating of the current portion of each of the index's 2,005 rolls is made possible through the maintenance of a machine-language data base. Each month the change data is fed into the computer and merged with the latest magnetic tape master file. The conversion into human-readable characters on microfilm is made possible by COM (computer output microfilm) equipment. This equipment also automatically adds an index bar code or code line between images on the film. The rolls of current index information are then cut into segments and used tc replace the outdated portion of each film roll.

The common problem of quick and proper identification of images within each roll of film is solved through use of the bar code or code line image finding technique. In this technique, each frame of microfilm also contains a bar code or code line representing the soundex code of that particular film frame, in addition to the basic index information. The actual position of these bars or lines reflects the soundex code for any given image. Both the pre-1958 segment of the index and the updated segments have bar codes or code lines properly positioned on each film roll.

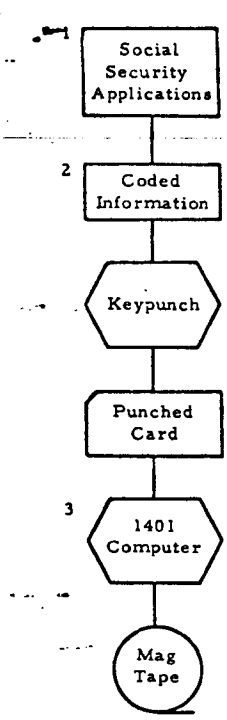
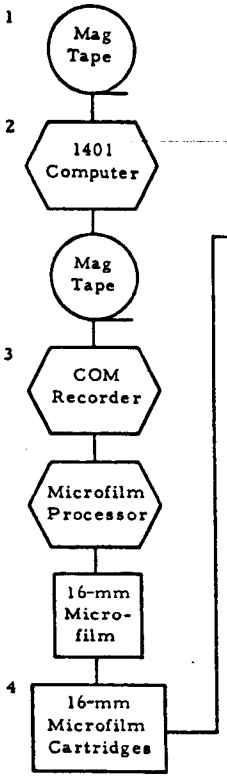
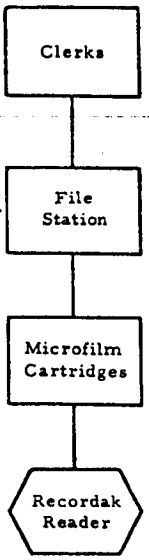
For better operating efficiency, 165 search stations have been established with each sta-

tion assigned an average of rolls housed in cartridges. Each search station also has a mechanized roll microfilm reader using microfilm cartridges. It is electrically driven with varying forward and reverse speeds. The work stations have a processing capability of over 40,000 searches a day.

In an actual search, which usually takes about 30 seconds, the index clerk first selects and inserts the proper cartridge into the reader. The bar code or code line scales on the reader are then adjusted to match the soundex code of the search image. Actuation of the start switch moves film frames past the reader's bar code or code line scale. As the film bar codes t closer to the microfilm reader's code position the clerk slows film movement so individual frames may be scanned.

REMARKS. In addition to the extensive space savings and ease of updating, this mechanized roll microfilm system also has the advantages of localization of search to 10 images or less; relatively low input costs for the initial conversion to microfilm; fast finding, loading, and unloading of film cartridges; and the option of using any standard roll microfilm reading equipment, since any reader can be adapted to use the bar code or code line image finding technique.

NATIONAL EMPLOYEE ACCOUNT CARD HOLDERS

INPUT PROCESSING	STORAGE	SEARCH AND RETRIEVAL
		
1. Reflects new social security applications. 2. Clerks and keypunch operators transform information into machine readable language. 3. Computer program converts coded punched card information to magnetic tape.	1. Master file on magnetic tape. 2. Accepts new information on registrants and merges with master file to create new updated master file. 3. Magnetic tape master file converted to photo-optical binary coded microfilm through process of recording, developing, and fixing. Recorder photographs information, adding bar code on 1,000 ft. microfilm rolls. 4. Film is cut into segments and spliced onto film in microfilm cartridges and sent to file station.	Clerks distribute requests to microfilm retrieval work stations. Index clerk places appropriate cartridge in reader and finds proper information through use of film bar codes.

NAME OF SYSTEM:

Automated Personnel

ORIGINATOR:

Automated Personnel Management System

Federal Housing Administration

Department of Housing and Urban Development

Washington, D.C. 20410

OBJECTIVE. To develop a comprehensive integrated personnel data system that will satisfy the Federal Housing Administration's (FHA) various and continuing personnel management and information needs.

BACKGROUND. The Federal Housing Administration carries out broad Federal programs of loan and mortgage insurance as authorized by the Federal Housing Act. The FHA employs about 8,500 personnel throughout the United States in support of these responsibilities. For many years the FHA has been in the forefront of those government activities taking advantage of the capabilities of nonconventional information retrieval methods and techniques to better manage their broad range of affairs. For example, FHA's present Automated Personnel Management System utilizes magnetic tape as the storage medium for their large personnel file.

Illustrative of the growing trend toward shared use of computers, this system exists as a by-product of a completely integrated personnel management application, which in turn shares computer time with several still larger systems in the same computer center. Several of FHA's personnel functional areas benefiting from the storage and retrieval capabilities of this system are the payroll office, personnel placement office, and personnel management activity.

The personnel placement office shall be used to illustrate this system's characteristics in solving information retrieval requirements. This office has information needs of a specific nature due to its interest in evaluating qualifications and eligibility of individuals for promotion or to fill new or vacant positions. To assist in solution of this problem, a magnetic tape skills inventory file contains such helpful information as occupational series, training courses completed, years of service, grade span, and academic fields.

THE NEW METHOD. The initial input of source data to the personnel data master file is the Personnel Transaction Form. Though quite similar to the Standard Form 50, it contains additional information on personnel skills and other data that comprise each employee's profile. Data on the form is coded by a personnel clerk and then converted to punched paper tape on an automatic typewriter. The punched paper tape is forwarded to the computer activity for conversion to punched card format and then batched with other input cards for computer processing and storage on the magnetic tape master personnel file.

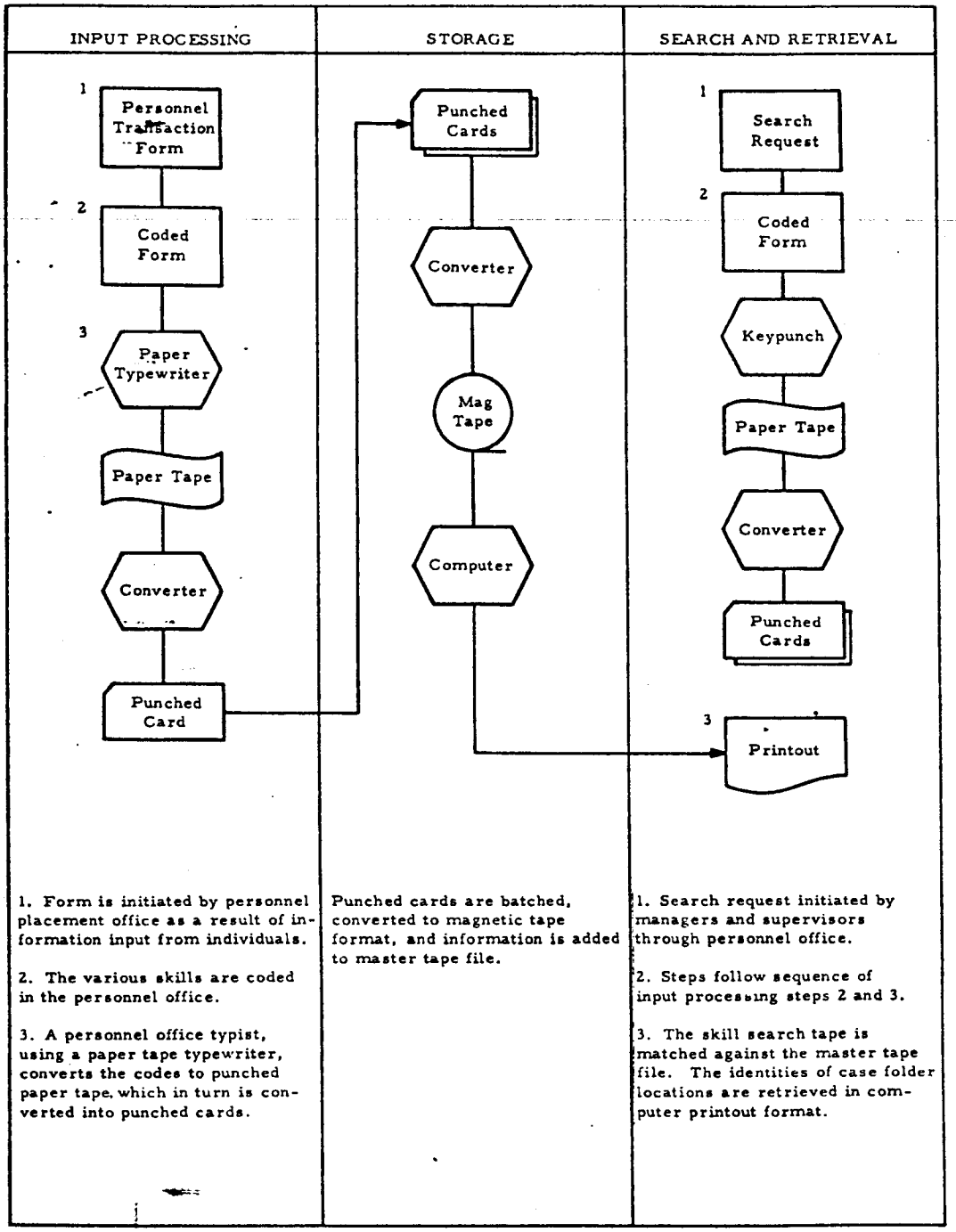
Search requests initiated by managers and supervisors that concern personnel who might be qualified for new or unfilled positions are handled in much the same manner as the initial input to the master file. First, all pertinent skills and other qualifying features of the position are recorded on a skills locator form. This form, which has a potential of 43 different entries, is then reduced to a coded format on punched paper tape for conversion to punched cards. At the computer center, the technicians gather the punched cards for batching prior to their conversion to magnetic tape. After conversion, the skill search tape is programed for matching against the master file tape. The names of individuals found eligible for the position, together with their file folder location identities, are retrieved in the form of a computer printout. A copy of the printout may then be forwarded to the original requesting office for study. Where appropriate, the employee file jacket may be obtained for further study and further action.

REMARKS. The FHA automated personnel system supplies management with impor-

tant information through complex data correlation and improves the overall effectiveness of the personnel system. It produces all regular periodic personnel reports and can analyze information based on specific programing to select the most qualified person for various job vacancies.

This system is a good example of the sharing of computer usage with other organizational elements. Because of the computer's fast processing speed and the FHA system's relatively small workload, a computer could not be justified for use as an information and retrieval system alone.

AUTOMATED PERSONNEL



NAME OF SYSTEM:

Video Tape Information Storage and Retrieval

ORIGINATOR:

Management and Operations Assistance Division
Federal Housing Administration
Department of Housing and Urban Development
Washington, D.C. 20411

OBJECTIVE. To develop an effective automated system for storage and retrieval of case documents essential to the program and administrative functions of the Federal Housing Administration.

BACKGROUND. Since 1934, mortgages on millions of housing structures have been insured by the Federal Housing Administration. The responsibility for the documentation associated with insurance case handling rests mainly with FHA's Management and Operations Assistance Division. Weekly, the Division files about 9,000 new case binders (folders); adds 35,000 pieces of correspondence to in-file case binders; and refiles 3,000 case binders returned by users. The Division also services requests for about 600 case binders daily and retires approximately 250,000 terminated binders annually.

The current file consists of about 4,500,000 cases containing approximately 120,000,000 documents, and it fills 6,500 five-drawer file cabinets occupying 55,000 square feet of floor space. This continuously expanding file gives rise to a mounting number of problems in attempting to provide up-to-date information in an effective manner. After reviewing numerous proposals for graphic storage, retrieval, and presentation systems, the FHA authorities selected the video tape system.

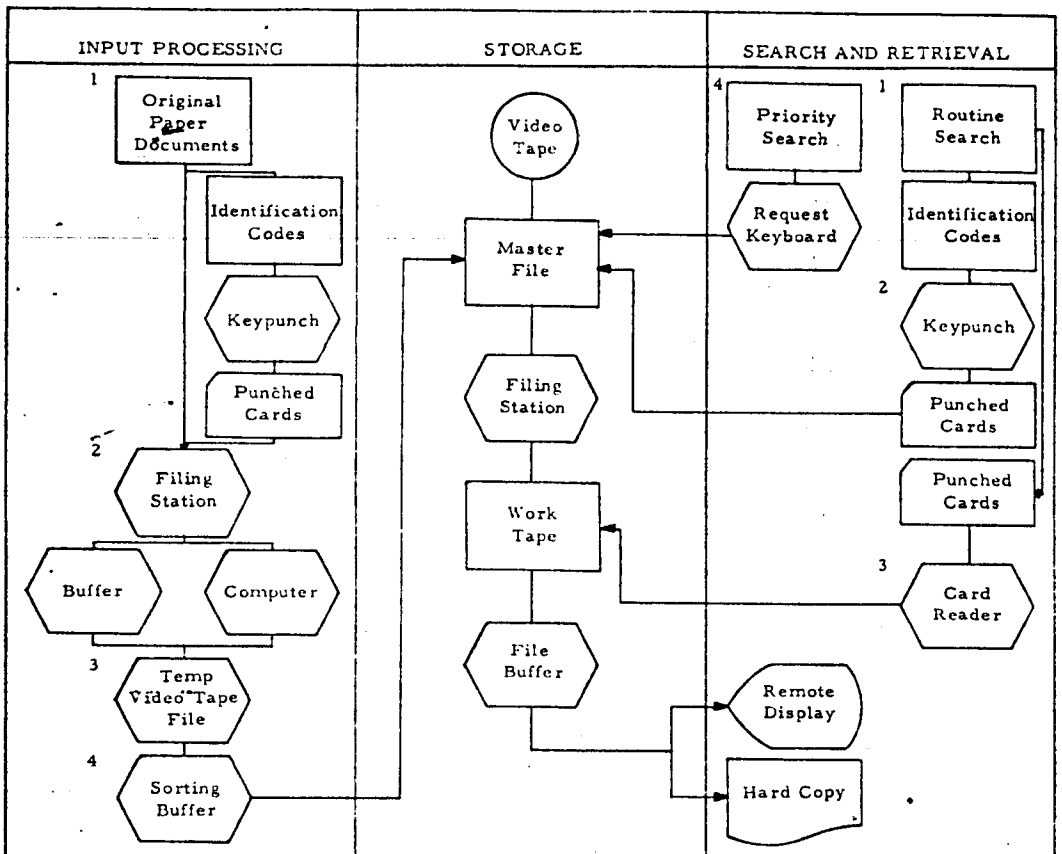
THE NEW METHOD. The FHA Video Tape Information Storage and Retrieval System combines video tape processing with computer technology. Document images are recorded onto video magnetic tape by a television camera mounted in a 75 documents-a-minute automatic filing station. Retrieval of information is accomplished through 21 remote display stations (cathode ray tubes) located in selected FHA offices throughout the HUD Building in Washington. All filing, retrieval, and purge routines are computer controlled and are activated on-line through a teletype keyboard.

For routine requests, users order documents by entering the case number in a punched card. Since the master video tape file is in sequential order by case number, the punched cards are arranged in the same sequence and batched. The cards are processed across the master video tape file at night and the requested document images are transferred to work tapes that are mounted on tape drives for retrieval the next day. The punched cards are returned to the requester, who inserts them into the punched card readers at his remote display station to call up documents to be viewed. When a card is inserted into the reader, the work tape is automatically searched and the document images for that case are electronically transmitted and temporarily copied (stored) on a magnetic disc located in a buffer section connected to the remote station. This makes it possible for the user to leisurely browse back and forth through the document images without tying up the master file. Should hard copy be required, the user may request printouts of selected documents or the entire case file.

REMARKS. The manual files operation, presently located four miles from the HUD Building, will be eliminated when the new system is installed in the departmental building to provide more effective service. The case binder records occupying 55,000 square feet are being converted to an operating system requiring a total of 3,600 square feet. The actual video magnetic tape files will require only about 90 square feet of this space.

The mortgage documentation records will always remain in the file, since document images are copied rather than removed from the master file when needed for viewing. Additionally, the problem of out-of-file documents and the time and expense for manual file maintenance are eliminated under the video tape file system.

VIDEO TAPE INFORMATION STORAGE AND RETRIEVAL



1. Document descriptive data converted to digital address on punched cards.

2. Document and pertinent punched card descriptive data loaded into automatic filing station. The graphic images and associated index data is simultaneously recorded on video tape at rate of 75 documents per minute.

3. Recorded data in electronic image form is temporarily held in intermediate storage pending entry into master file.

4. Daily accumulation of data is sorted into document case sequence for merging with master file.

Master video tape file consists of over 4.5 million mortgage case files organized in case number sequence. Each tape reel holds 127,000 document images when full.

1. Routine searches are initiated through use of punched cards showing case number desired.

2. Daily searches are batched and processed against master file with pertinent document images transferred to a working video tape file.

3. Retrieval of data at remote search stations is actuated by placement of punched card in card reader. Proper case image is displayed on CRT remote monitor. Searcher may obtain hard copy facsimile of image if desired.

4. Priority searches are initiated at remote terminals through request keyboard directly to master file. Retrieval options are as noted in item 3 above.

NAME OF SYSTEM

Land Patent Control Document Index

ORIGINATOR:

Bureau of Land Management
Department of the Interior
Washington, D.C. 20240

OBJECTIVE. To develop and implement an information handling system that will help preserve old historical patent documents and improve the management of public land records.

BACKGROUND. The Bureau of Land Management (BLM) is responsible for the conservation and management of public domain lands and resources of the Nation. The forerunner of the present Bureau, the General Land Office, was established in 1812 to "keep land records and record titles." Today, the Bureau of Land Management is responsible for all the control documents, which include patents, lists, and other instruments that convey title. These control documents pertain to the one-half billion acres of present public domain land and the more than one billion acres, representing seven million ownership titles, granted since the first public land patent in 1788.

The methods of keeping these public land records had changed little through the years until it became almost impossible to handle some of the older, active records. The Bureau of Land Management solved the problem by turning to microfilm as the best medium for preserving the old records as well as for day-to-day search and retrieval activities.

THE NEW METHOD. Beginning in 1955 and lasting for one year, all the old records legible enough for processing were recorded on 35-mm. microfilm. Subsequently microfilm positive images were made from the master file and mounted on aperture cards. More than four million such cards were produced. Later, the aperture cards were keypunched, sorted by land description, and duplicated. One copy was shipped to the appropriate State land office to satisfy local management needs and the other remained with the BLM in Washington, D.C.

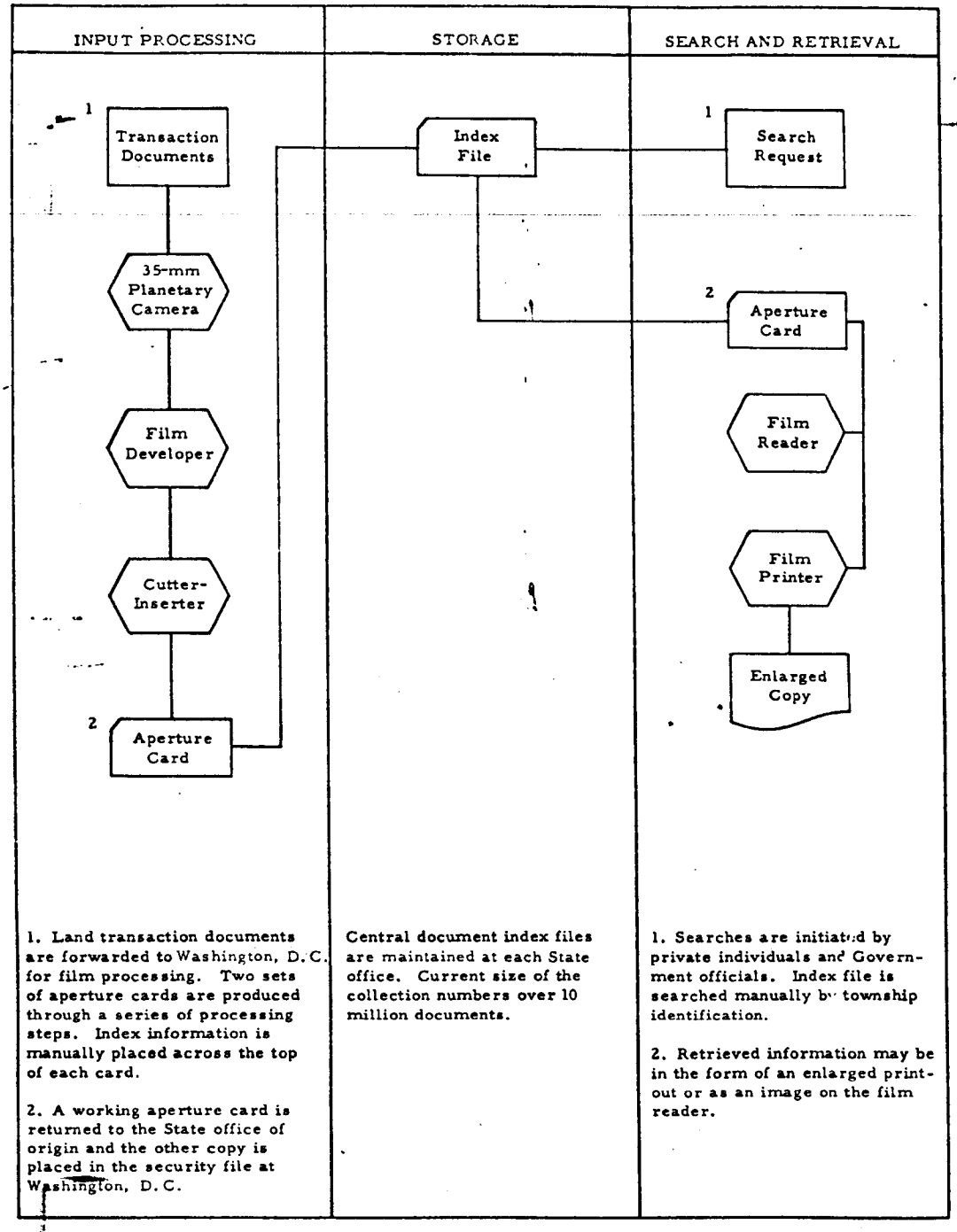
Under present procedures, newly created control documents originating in the 12 regional offices are forwarded to the Bureau of Land Management in Washington. Documents, usually consisting of one to four pages, appear in many formats and pertain to orders, acts, and proclamations regarding rights and uses of land. Each record is recorded on 35-mm. roll microfilm, which is cut into individual images and mounted on military size D aperture cards. The identifying index information is then typed across the top of each card. Two such aperture cards are made for each control document. One is forwarded to the security file and the other sent to the originating State's public use file. Files are arranged geographically by State, meridian, and township. Within the township file, they are filed chronologically by the effective date of issue.

The users of the files include the general public, such Government agencies as the Department of Defense and the General Services Administration, and many State agencies. Individuals tracing the chain of land patent transfers request the land patent by meridian and township. Since location of the patent search is usually known, the search clerk can normally retrieve the proper aperture card in a minimum of time, on the basis of the printed heading. The searcher may either obtain an enlarged copy of the patent made from the aperture card or visually review the patent information on an aperture card viewer, which is usually located in the State's BLM public reference room.

REMARKS. The main advantage of the aperture card as a storage media for large and cumbersome documents is its small uniform size, which reduces the total storage space and facilitates document handling. The file's relatively small size makes it possible to store the documents close by the user's work area and permits fast retrieval. In addition,

the new system assures t... these valuable records will be spared further wear and tear and that they will be protected against accidental loss or destruction. Further, there is available a wide variety of relatively low-cost equipment for vie...ng, duplicating, and making paper enlargements of the images. Finally, the cards can be keypunched, if desired, to permit machine sorting, merging, and searching.

LAND PATENT CONTROL DOCUMENT INDEX



NAME OF SYSTEM:

SDI Current Awareness

ORIGINATOR:

Office of Engineering Reference
Bureau of Reclamation
Denver, Colorado 80225

OBJECTIVE. To design and establish a system for selective dissemination of information (SDI) to members of the Bureau's Engineering and Research Center in order to increase the staff's opportunity for obtaining significant literature on subjects of interest.

BACKGROUND. The Bureau of Reclamation is responsible for planning, designing, constructing, operating, and maintaining multipurpose water resources projects in the Western United States. A vital element in the success of these efforts is the Engineering and Research Center at Denver, Colo. Its Office of Engineering is responsible for keeping abreast of the technical literature in the broad field of water resource investigation. Among the office's many functions is that of developing improved methods for alerting the staff and field personnel to meaningful literature. To better satisfy this objective, the Office of Engineering Reference several years ago established an SDI system for staff and field engineers, specialists, and management personnel.

THE NEW METHOD. This system evolves around the matching of an individual's fields of interest descriptors (indexing terms) with descriptors that have been assigned to individual documents acquired by the Office of Engineering Reference.

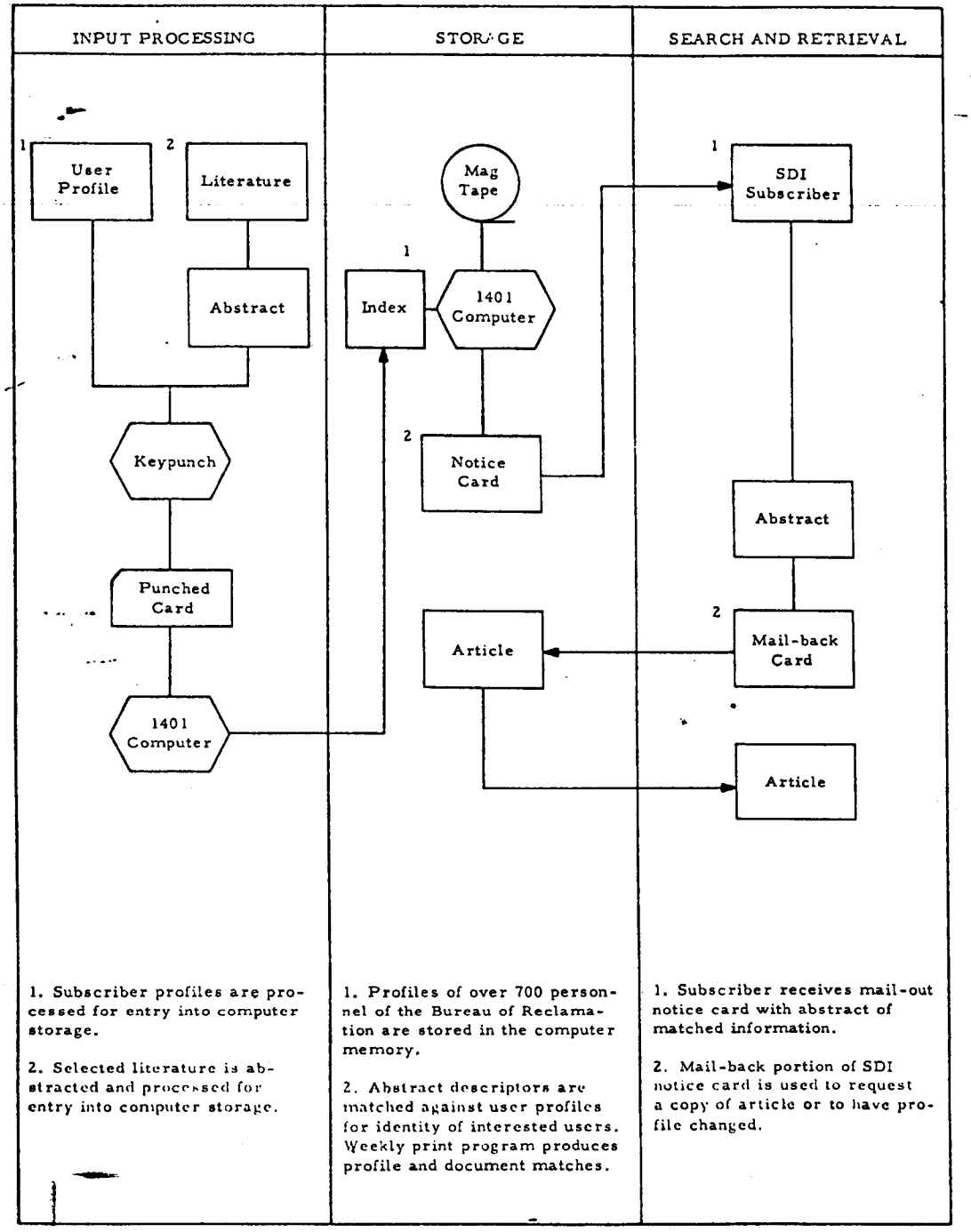
Each document selected for possible inclusion in the SDI system is first scanned by an engineer or scientist whose job assignment concerns that specific subject matter area. Professional library personnel index the articles in depth, abstract the essential information, and compile the necessary bibliographic data. The information is then converted to magnetic tape format for entry into the computer's SDI matching program.

A thesaurus word list specially developed for this purpose is used for indexing both the employee interest profiles (subject areas of interest to them) and the documents. The list contains about 3,300 descriptors representing the Bureau's point of view on all aspects of water resources development. When a new document is entered into the system, the Bureau's computer compares the list of descriptors describing individual user interests with those assigned the document. As matches occur, the computer prepares lists of individuals who are likely to be interested in the selected document. Abstracts of the documents are then automatically disseminated to them. A response card is enclosed with the abstract for completion by the recipient as to the accuracy of the match. This feedback of information allows for appropriate adjustments that are intended to improve the user's profile selections by eliminating literature of little interest. In filling out this response card the recipient also indicates how useful the information was and whether he wants the complete document.

REMARKS. Through feedback of the recipient's response cards, the effectiveness of the SDI system can be constantly evaluated. Where the response cards indicate that the information is pertinent, it is clear that the matching profiles seem to function satisfactorily. Where they indicate that the information should be more pertinent, the system may need to be improved or expanded. As changes occur in a recipient's interests, feedback to the system causes his profile card to be updated. Thus, the users are reasonably assured that documents relating to their job assignments will be brought to their attention, and they, at the same time, are relieved of the time-consuming, tedious chore of having to personally assemble and scan the enormous volume of documents being produced today.

The computer program includes a program technique that gives relative weight to both user profile and document abstract descriptors. This feature tends to eliminate less relevant matches and assures a more meaningful selection of abstracts. The document index file can also be used in the normal manner for conducting retrospective searches upon request of the users.

SDI CURRENT AWARENESS



NAME OF SYSTEM:

Information Retrieval and SDI Current Awareness

ORIGINATOR:

Bonneville Power Administration (BPA)

U.S. Department of the Interior

Portland, Oregon 97208

OBJECTIVE. To establish a system for selective dissemination of information (SDI) that will better assure that new electrical engineering information is promptly brought to the attention of the engineering and technical personnel assigned to the BPA.

BACKGROUND. The Bonneville Power Administration is an agency of the U.S. Department of the Interior and is responsible for the marketing of power produced by Federal multipurpose dams in the Columbia River Basin system. This complex represents the largest hydroelectric development of any single river basin in the world. In fulfilling the mission, the Administration employs 600 engineers, the majority of whom are interested in electrical engineering and related subjects.

The growth rate of scientific knowledge and the parallel increase in professional literature has made it increasingly difficult for engineers and scientists to keep abreast of new developments in their fields of interest. They often have no choice but to read material because it may seem to contain substantive matter, only to find it is meaningless. Conversely, because of the sheer mass of new literature, many items of professional value may be overlooked.

Because of the need for its staff to keep abreast of these new technological developments, the BPA established a computer-based system for periodic, selective dissemination of information.

THE NEW METHOD. This SDI system is based on a BPA modification of a System 1401 computer program developed by the International Business Machines Corporation. In broad terms, the system establishes and maintains a list of 400 BPA members desiring to obtain periodic notification of abstracts of specific literature. Each subscriber has at least one interest profile (subject areas of interest to him) recorded on the magnetic tape file. The average range of profiles per participant is six to 10.

Each week the BPA library selects about 125 abstracts from American and foreign professional literature in the field of power transmission. Screening of literature is performed by a professional engineer on the library staff. The abstracts either accompany the literature or are obtained from abstracting services. The selected abstracts are converted to punched cards for processing. The input cards are coded to show information covering author, title, source, summary, and comments.

The indexing of individual items within the context of SDI consists of assigning descriptors (indexing terms) and phrases to the abstract so that it can be used for matching against the users interest profiles in the subsequent processing action. An automatic indexing system is primarily used for this purpose. Descriptors are lifted directly from the terminology appearing in the text of the abstract and, based on a matching program, are appended in alphabetical order to the abstract record.

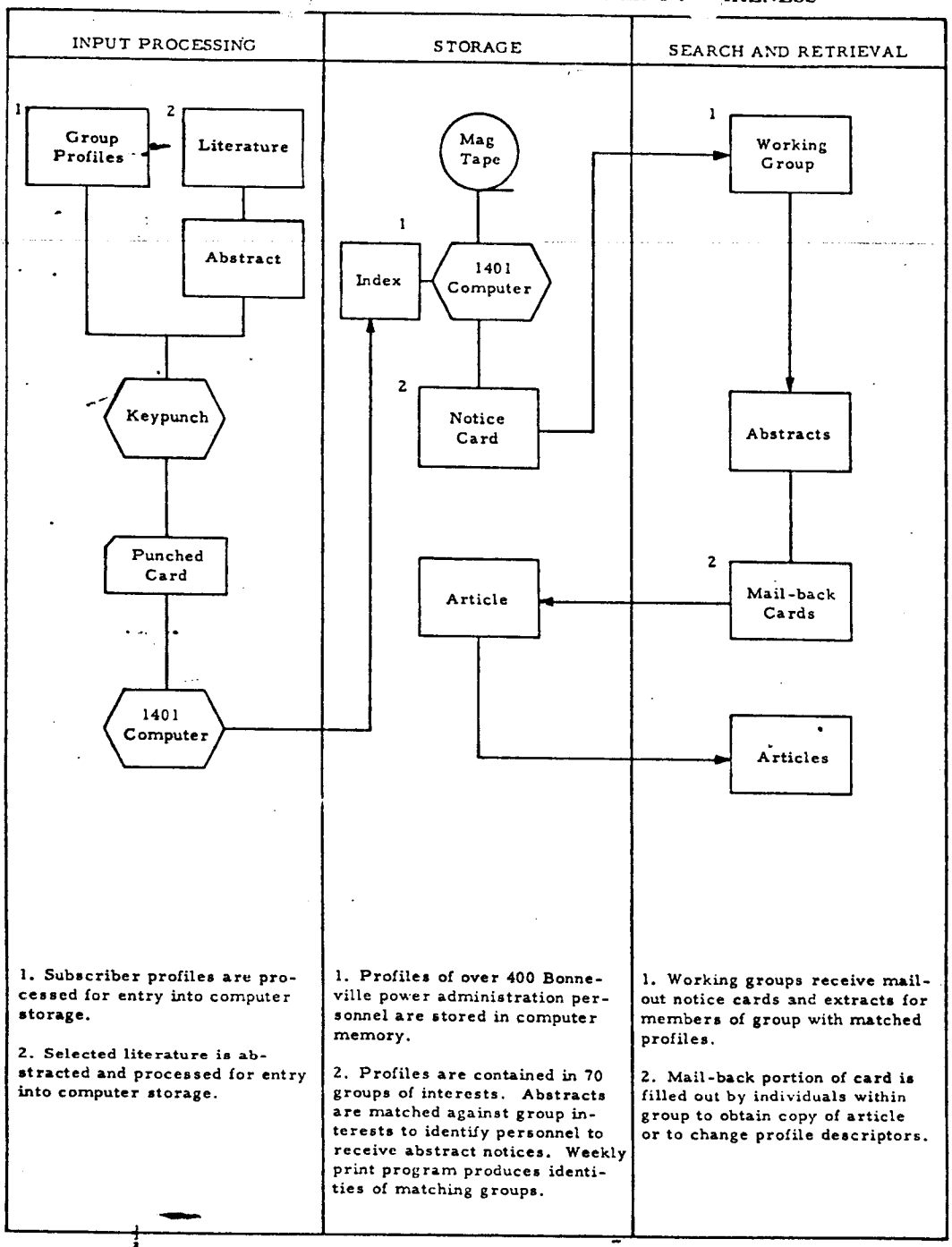
Weekly computer runs match the abstract indexes against user profiles to produce a printed abstract card notice alerting a subscriber to literature of interest. Should he then desire a copy of the actual document, he need only detach an accompanying self-addressed notification card and forward it to the library.

REMARKS. Perhaps the outstanding feature of this pioneering Selective Dissemination of Information System is its flexibility, which includes its ability to serve both current awareness and retrospective search functions.

For retrospective search, the abstracts are retained on a cumulative magnetic tape file and processed against special inquiries as needed. When the file approaches unreasonable limits, a special program purges the abstracts appearing to have the least retention value. About 1,400 output notices are printed per week for the current awareness processing.

Engineers enrolled in the Bonneville SDI system have expressed satisfaction with its ability to disseminate a higher proportion of meaningful information. Evaluation cards completed by subscribers reveal that 57 percent have a direct interest in information received. Of particular interest, only 4.5 percent of those having a direct interest had seen the subject matter before being alerted by the SDI system.

INFORMATION RETRIEVAL AND SDI CURRENT AWARENESS



NAME OF SYSTEM:

RIRA Legal Information

ORIGINATOR:

Reports and Information Retrieval Activity

Office of the Chief Counsel

U.S. Internal Revenue Service (IRS),

Washington, D.C. 20224

OBJECTIVE. To develop and operate a document reference system that will provide for more comprehensive and timely information by which legal and management personnel can make their decisions, thus assuring a more consistent treatment and handling of taxpayer matters and the many IRS tax cases.

BACKGROUND. The Office of the Chief Counsel, IRS, is responsible for adjudicating over 28,000 income tax cases annually. This workload is divided among hundreds of attorneys assigned to Washington and the many field offices. Two problems of continuing concern have been those of "network" coordination of pending legal cases and difficulty in maintaining legal consistency in tax cases of a similar nature.

An IRS study group found that better communication and coordination between Washington and the field offices should alleviate the condition. The study group recommended that a uniform subject classification system be established throughout the network.

THE NEW METHOD. The heart of the RIRA (Reports and Information Activity) legal information system is the Uniform Issue List, issued in two distinct formats. The first and more stable basic list is keyed directly to the Internal Revenue Code and arranged sequentially by an eight digit code numbering system. In appearance, the format arrangement ~~is~~ not unlike the hierarchical subject classification outlines appearing in conventional filing manuals. The Uniform Issue List covers over 6,000 subjects and is listed on 85 printed pages.

The companion handbook incorporates the permuted index technique and is known as the KWIC (*Key Word In Context*) Index to the Uniform Issue List. The KWIC Index is a computer prepared and maintained reference index. The major task in preparing this index was the conversion of all subject topics and code symbols contained in the basic Uniform Issue List to machine language. With the aid of computer programs, the machine output was in the appropriate KWIC Index format.

In appearance, the KWIC format is an arrangement of two columns of information. The first column near the center contains a permuted alphabetic listing of all pertinent words included in the subject topics of the Uniform Issue List together with the words immediately before and after the key word. The second column, at the far right, indicates the eight digit code symbol of the Uniform Issue List entry applying to the particular permuted term. In essence, the KWIC Index serves as an alphabetic cross reference index to the Uniform Issue List and the individual tax case files.

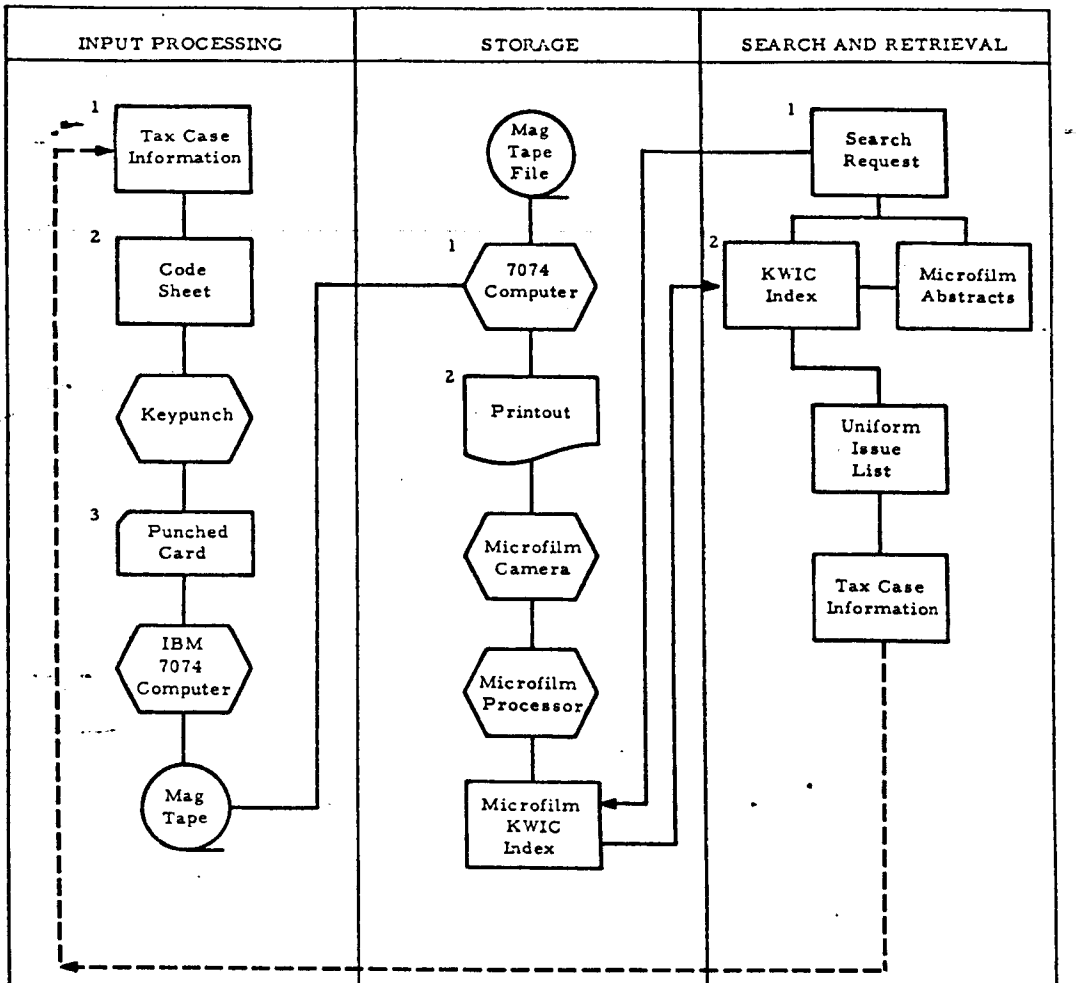
The key sources of information input to the KWIC Index are the monthly submissions forwarded by the field attorneys to the IRS Data Center in Detroit. These reports show the classification codes assigned new cases during the reporting period and also include abstracts covering the essential features of each case. The central computer then consolidates these hundreds of cases in Uniform Issue List and KWIC Index order. These listings, along with the abstracts, are microfilmed, and copies are sent to the field offices to provide the legal staffs a simple low-cost reference tool for use in carrying out their work. The same aids are also used by attorneys and management officials in the main office.

REMARKS. The computer produced permuted or KWIC Index of four or five word entries is a most efficient method of finding references in depth, especially where conditions dictate a large base of subject entries. Manual methods of establishing and main-

taining this type information in accumulative fashion are usually impractical, except when the total entries are in the hundreds; and even then, manual methods are not as comprehensive as a KWIC Index.

With many standard off-the-shelf computer programs available for preparing a KWIC Index, the total cost of such indexes has been substantially reduced. Additionally, the computer printout may serve as the final copy for offset printing of the index. KWIC Indexes may be produced and revised periodically, often at a nominal cost, for use at many locations, as in this example.

RIRA LEGAL INFORMATION



1. New tax case classification information received periodically from field and headquarters attorneys at IRS Data Center, Detroit, Michigan.

2. Technicians convert information into code for use by keypunch operators.

3. Punched card information plus computer program transforms new information into magnetic tape format.

1. New tax case information merged with old tax case information to make new updated KWIC index file through use of KWIC index program.

2. Computer print program produces new KWIC index which is converted to microfilm and forwarded to field offices.

1. Attorney formulates search terms applicable to new tax case.

2. Using the KWIC index and quarterly abstracts and Uniform Issue List as aids, he adjudicates the case and periodically forwards the information to the IRS Data Center.

NAME OF SYSTEM:

National Crime Information Center (NCIC)

ORIGINATOR:

Federal Bureau of Investigation
Department of Justice
Washington, D.C. 20530

OBJECTIVE. Through utilization of the latest computer and communication technologies, to design and operate a centralized information and retrieval system that will greatly improve the effectiveness of crime prevention and detection procedures throughout the country.

BACKGROUND. The idea of a centralized crime information facility was conceived as a result of law enforcement's growing need for faster receipt of crime information, made imperative by the steadily rising incidence of crime and the increased mobility of criminals.

Advances in computer and communication technologies seemed to offer new solutions to these needs. Therefore, the FBI, in conjunction with the Advisory Group to the Committee on Uniform Crime Records, and other local, State and Federal agencies, agreed to exploit these new technologies in their crime fighting efforts. Thus, a series of policy and procedure meetings were held to formulate a program, which led to the establishment of the National Crime Information Center (NCIC). The information center began operations in January 1967. Since that time, due primarily to the support from local police, the system has expanded at a rate far exceeding original expectations.

THE NEW METHOD. The new system, located at the FBI Headquarters in Washington, D.C., is designed for the rapid interchange of information among law enforcement agencies—including most States, the District of Columbia, and Canada. The NCIC is an on-line, real-time information retrieval system.

Connecting te. nals, placed near radio dispatchers, are located throughout the country in police headquarters, sheriffs' offices, State police facilities, and Federal law enforcement agencies. Dispatchers can respond quickly to requests from policemen on the street—an inquiry can usually be answered in less than a minute following the inquiry, if the proper procedure is followed. Presently, about 93 terminals are connected to the information system. This includes pertinent incoming data for storage in the file, in addition to inquiries relating to search requests. The base data stored in the computer memory contains data on such matters as wanted persons; stolen and wanted vehicles and license plates; stolen articles; missing or recovered guns; and stolen or missing stocks, bonds, currency, etc.

All items in the above categories are given identifying numbers for searching purposes. The system presently contains 1.8 million records, with an average daily transaction load of 55,000. This volume reflects updating of old records, the entering of new records, and processing of inquiries on suspected crimes or criminals. The system is now averaging 525 positive responses daily to law enforcement officials. These informative responses from the NCIC are considered as guidance only, and investigations are not terminated until confirmation is made with the originating agency. Cooperating agencies are responsible for maintaining the accuracy of their records, updating them when necessary, and purging the records no longer needed.

To illustrate how the system works, let us assume that a State trooper notices an abandoned car. He radios the pertinent data to his radio control dispatcher, who passes the information by informal note to a remote terminal or teletype operator. At that point, the operator arranges the information in properly coded transmission sequence for communicating with the NCIC in Washington.

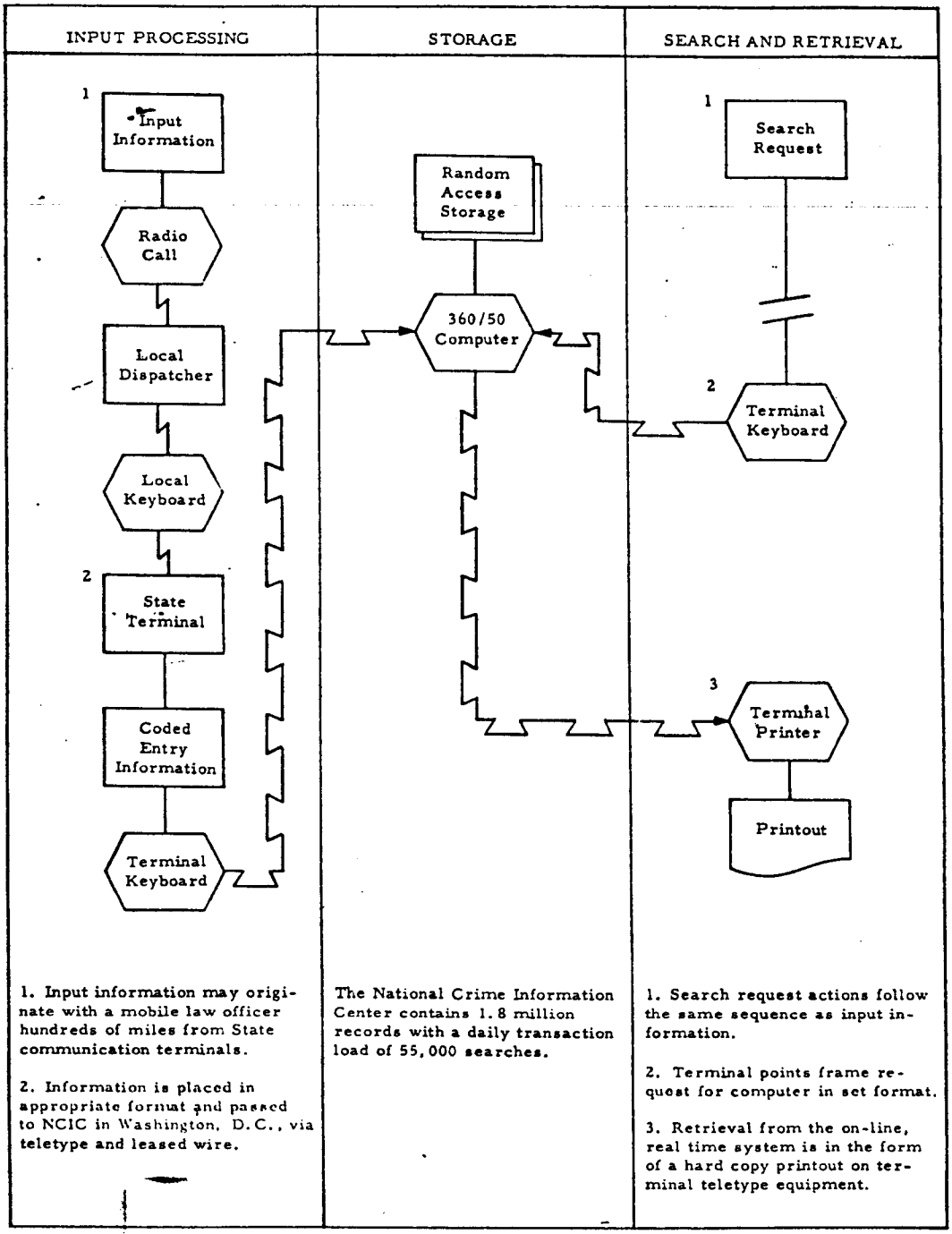
The entry procedure includes identifying the station originating the request, the subject file to be interrogated, and last, the coded

brief of the search request. At NCIC headquarters the IBM 360 Model 50 computer, with the aid of a sophisticated program, searches its random-access storage unit and—in this example—finds a "match" identifying the abandoned vehicle as one that was reported stolen. Within minutes, the NCIC terminal keyboard operator teletypes the answer to the requesting police agency, which then arranges to have the car returned to its owner.

Information intended as input for the system's data bank storage unit is handled in much the same way as a search request.

REMARKS. This system is a good example of how computer and communication capabilities have been utilized to meet a growing information problem. The computer's ability to quickly store, retrieve, and manipulate large quantities of randomly filed data, coupled with the capability for fast transmission of information over great distances, has enabled law enforcement officers at remote locations to communicate with the NCIC almost instantaneously. These machine capabilities and the close cooperation of the local, State, and FBI law enforcement bodies will play an increasingly important role in the battle against crime.

NATIONAL CRIME INFORMATION CENTER



NAME OF SYSTEM:

Congressional Information Network

ORIGINATOR:

Legislative Reference Service
Library of Congress
Washington, D.C. 20540

OBJECTIVE. To develop and operate a document storage and dissemination system capable of providing the members of Congress with current information as to the status of legislation, committee hearings, the budget, and other significant matters.

BACKGROUND. The United States Congress, as it enters the decade of the 1970's, is faced with legislative demands of extraordinary complexity. Each congressional member must function effectively in his several distinctive roles of office. These activities include that of legislator, rendering decisions of national and often world-wide importance; of prime representative of his State or district; and of helper to constituents having specific problems or complaints. The ability of the Congressmen and their committees to effectively discharge their duties is often hindered by the great number of routine tasks to be performed, the great variety of information to be acquired, and the diverse issues to be evaluated.

The stresses upon the members and their staffs have been augmented by the effects of the information explosion. The profusion of books, articles, analytical reports, and miscellany threatens to overwhelm the present information handling centers. Traditional procedures for acquiring, indexing, abstracting, storing, processing, retrieving, and disseminating urgent information do not effectively meet present demands. Thus, the Congressman must evaluate new methods, techniques, and tools to assist him in the performance of his legislative and administrative tasks. Steady advances in information handling technology over the past 20 years now demonstrate the proven potential of technology to better support the Congress in a number of application areas.

The following example is but a beginning in a series of automated information processing programs aimed at enhancing the chamber, committee, and individual member performance.

THE NEW METHOD. The Library of Congress, Legislative Reference Service (LRS), is now providing more responsive support to Congressional members and committees in the information sciences. The first application of the system for the Congress was the "Digest of Public General Bills," which summarizes the essential features of all public bills and resolutions. Essential identifying information on each piece of legislation includes the name of sponsor(s), the date introduced, the bill number, and the committee to which assigned, plus synoptic and indexing information. This information is placed in the disk storage unit of an IBM 360, Model 40 computer through use of a remote ATS (administrative terminal system) text processing system. Six IBM Model 2741 remote terminal selectric typewriters are used for insertion, recall, and editing of the "Bill Digest" information. The Digest is produced cumulatively every two months, with supplements produced every two weeks. Each of these publications is printed by photo-offset methods by the Government Printing Office (GPO).

Each month a "Legislative Status Report" encompassing digests and status information on 200 to 300 major bills is produced, using the same ATS remote terminal and storage system. The 11 by 15 inch computer output continuous paper form is reduced to an 8½ by 11 inch master copy through use of a Xerox 2400 Mark IV duplicator. The necessary copies for distribution to the Congress and other interested agencies and individuals are produced by a Multilith duplicator. The ability of the computer to add data elements without regard to sequence and to rapidly change obsolete material have proven to be particularly useful in this application.

The Congressional Information Network is also used for producing and disseminating the periodic "Congressional Committee Cal-

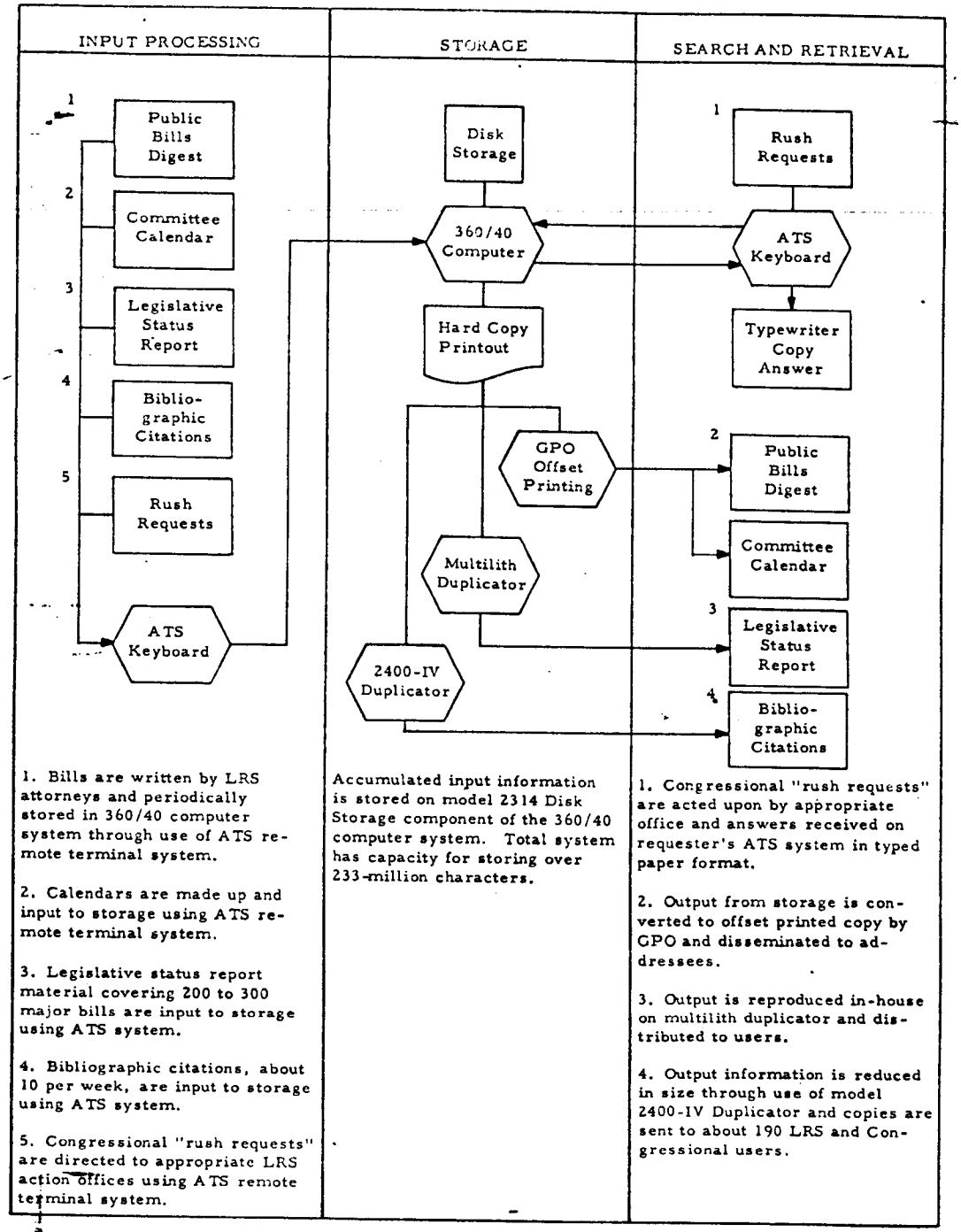
endars." Additionally, bibliographic reports in the form of a weekly list of about 10 significant citations is disseminated on a selective basis to individuals whose areas of subject matter interest match the indexing terms covering the contents of the selected citations. About 190 personnel in the Legislative Branch are currently using this service.

Currently there are 29 active remote ATS terminals involved in the overall system. Of these, 23 are located in LRS and two are located with congressional committees.

REMARKS. As the complexity and diversity of the tasks confronting the Congress increase, the importance of utilizing every possible means of acquiring and analyzing selected priority information before making decisions will become increasingly critical. The role of electronic technology will assume broader proportions as the legislator strives to fulfill his responsibilities and is willing to rely upon support from such systems.

The above-cited examples are only the start of a greater utilization of the benefits of computer and associated technologies. For example, during 1971, Data Central—a powerful, full-text, on-line retrieval system—will be used for retrieval of bill digests and legislative status information. The bill digest data base is already available in the computer as a by-product of the current "Bill Digest" production.

CONGRESSIONAL INFORMATION NETWORK



1. Bills are written by LRS attorneys and periodically stored in 360/40 computer system through use of ATS remote terminal system.

2. Calendars are made up and input to storage using ATS remote terminal system.

3. Legislative status report material covering 200 to 300 major bills are input to storage using ATS system.

4. Bibliographic citations, about 10 per week, are input to storage using ATS system.

5. Congressional "rush requests" are directed to appropriate LRS action offices using ATS remote terminal system.

Accumulated input information is stored on model 2314 Disk Storage component of the 360/40 computer system. Total system has capacity for storing over 233-million characters.

1. Congressional "rush requests" are acted upon by appropriate office and answers received on requester's ATS system in typed paper format.

2. Output from storage is converted to offset printed copy by GPO and disseminated to addressees.

3. Output is reproduced in-house on multilith duplicator and distributed to users.

4. Output information is reduced in size through use of model 2400-IV Duplicator and copies are sent to about 190 LRS and Congressional users.

NAME OF SYSTEM:

Machine Readable Catalog Dissemination (Project MARC)

ORIGINATOR:

Information Systems Office
Library of Congress
Washington, D.C. 20540

OBJECTIVE. To develop and implement techniques and methods for converting source catalog card data into machine-readable form to improve library service nationwide.

BACKGROUND. As the name implies, the first responsibility of the Library of Congress is service to Congress. One department, the Legislative Reference Service, functions exclusively for that purpose. As the Library has developed, its range of service has come to include the entire Government establishment, as well as the public at large, so that it has become, in effect, a national library for the United States.

As we enter the 1970's, libraries across the nation are feeling the effects of the information explosion. The profusion of books, journals, analytical reports, and miscellany threatens to overwhelm even the most sophisticated information handling centers. Conventional library methods are presenting problems to the librarians and users alike. Among these problems are the preparation, maintenance, and searching of the 3 x 5 inch catalog or index cards, and preparation of shelf lists, control records, etc.

Computer technology now possesses the proven potential to support the library community in a number of application areas. Among several studies and applications currently being conducted by the Library of Congress is the MARC (*MA*chine-*R*eadable *C*ataloging) system that is now serving 90 subscribing libraries with weekly distribution of bibliographic data in machine-readable form.

THE NEW METHOD. The MARC System converts records for selected current catalog card entries into machine-readable form and distributes the information on magnetic tape reels to participating libraries around the Nation. The library participants, in turn, use these records as input for their local catalog card processing requirements.

The MARC tape distributed to participants contains separate files of information such as the machine-readable catalog record; an abbreviated author-title record, to include the Library of Congress catalog card number; and subject and descriptive cross-references for tracing records generated by the machine-readable catalog record. The machine catalog record includes all the data with which the cataloger and reference librarian have long been familiar, as well as certain new data elements that provide for augmented approaches to the catalog.

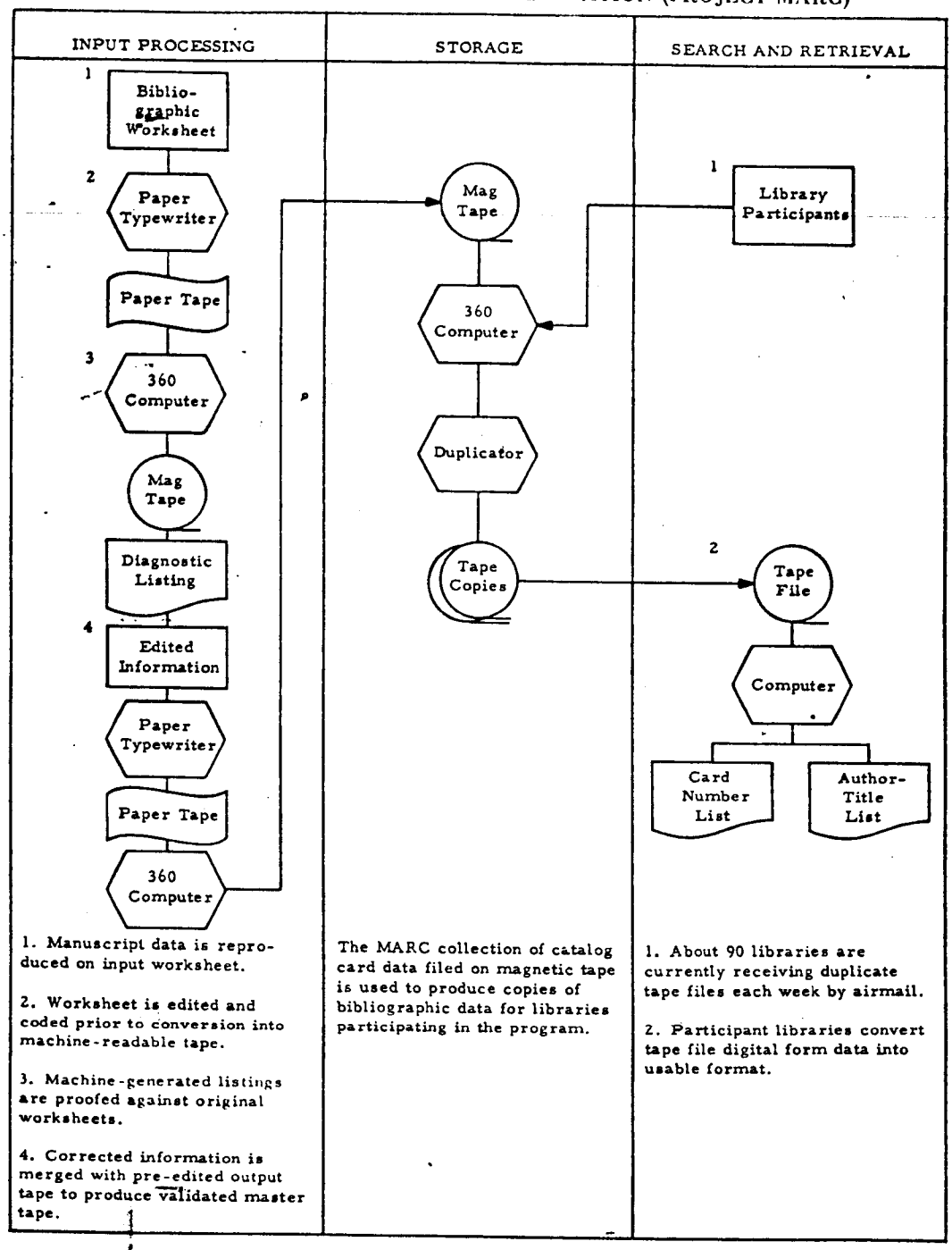
Processing within MARC begins with the receipt of a bibliographic record in the form of a reproduction of the card prepared by the Library of Congress catalogers. This card, used to produce the typeset Library of Congress catalog card, is reproduced on an input worksheet and becomes the source data for the MARC System. The worksheet information is edited, punched on a paper tape typewriter, and converted to magnetic tape. The data undergo both a daily and weekly processing cycle prior to output as a MARC master tape record. The master tape is then duplicated for distribution to participating libraries weekly.

REMARKS. One immediate result of the distribution of the MARC tapes has been the stimulation of interest in the concept of library data transmission. It has become evident, for example, that the MARC system has suggested to the library community the possibility that individual libraries can use a MARC-like system to contribute their own cataloging data for the use of others. Libraries will not only receive data from a centralized source like the Library of Congress, but they also may send data. This feature would bring much closer to reality the long anticipated concept of a network of libraries that can create and utilize a common data base.

A library participant, in evaluating the early results of the MARC Pilot Project, estimated that the system will minimize the searching, editing, keypunching, and verifying for about 24,000 volumes during the year. The MARC magnetic tape record represents a valuable potential for reducing operating costs and improving service since it can be used in a wide variety of ways, such as the automatic preparation of index cards, purchase orders, shelf lists, book spine labels, and charge-out cards; automatic searching of index records by computer; and on-line searching using remote terminals.

This example of dissemination of catalog data in digital form between the Library of Congress and the growing number of participating libraries throughout the Nation is only the forerunner of many additional library applications to be developed over the next few years. Since many of these concepts have application in the office world, their progress should be watched closely.

MACHINE READABLE CATALOG DISSEMINATION (PROJECT MARC)



1. Manuscript data is reproduced on input worksheet.

2. Worksheet is edited and coded prior to conversion into machine-readable tape.

3. Machine-generated listings are proofed against original worksheets.

4. Corrected information is merged with pre-edited output tape to produce validated master tape.

The MARC collection of catalog card data filed on magnetic tape is used to produce copies of bibliographic data for libraries participating in the program.

1. About 90 libraries are currently receiving duplicate tape files each week by airmail.

2. Participant libraries convert tape file digital form data into usable format.

NAME OF SYSTEM:

Aerospace Information Dissemination

ORIGINATOR:

Office of Technology Utilization

Scientific & Technological Information Division

National Aeronautics and Space Administration

Washington, D.C. 20546

OBJECTIVE. To assure that scientists and engineers working on NASA's advanced aeronautical and space projects, as well as other interested institutions and individuals, are kept informed of significant developments in their areas of interest and to provide a rapid economical means for obtaining needed information.

BACKGROUND. The NASA Office of Technology Utilization is responsible for the collection, processing, and communicating of scientific and technical information resulting from space program experience. Much emphasis has been directed toward placing this vast collection of knowledge in the hands of those who would explore its nonaerospace applications. Thus the information program managers have broadened the base of interest to a marked degree. The current Master Authority Address List reveals that an audience of over 2,700 public and private institutions are interested in NASA's collection of documents and publications.

THE NEW METHOD. The NASA information collection comprises more than one-half million documents and publications. This collection encompasses acquisitions from Government, industry, research institutes, and the academic community. In addition, NASA regularly receives technical literature and specialized reports covering various projects, laboratory findings, and new patent information.

Hundreds of additions to the document file are received daily at the NASA Scientific and Technical Information Facility at College Park, Md. Each document accepted as a potentially valuable addition is first given an accession number for control purposes. Those documents with a potential of broad interest are selected for conversion to microfiche format. Indexers then examine each selected document for pertinent bibliographic data and select the terms under which the document will be listed in the index. Abstractors review each newly-received document and develop appropriate abstracts, or may rewrite the abstract that accompanied the document if it does not conform with NASA standards.

The microfiche is roughly 4 x 6 inches and conforms with the COSATI (Committee on Scientific and Technical Information) microfiche standards. The distribution copy consists of a diazo sheet of negative film carrying images of as many as 60 pages. The bibliographic citation of the document appears in normal size print across the top.

The most widely used reference guides to the NASA scientific and technical information system's growing file of knowledge are two complementary bibliographical and abstract bulletins, *Scientific and Technical Aerospace Reports* (STAR) and *International Aerospace Abstracts* (IAA). STAR abstracts cover worldwide report literature on space and aeronautics, while those in the IAA provide similar coverage of scientific and trade journals, books, and papers presented at meetings. Expert processing and modern methods of printing keep the coverage of both journals remarkably current. Indexes are organized to show subjects pertinent to a variety of disciplines.

Users of the STAR and IAA document reference services may identify a desired document by citing its accession number. In addition to the accession number, the bulletin also includes such bibliographic information as the corporate source, the title of the report, and an abstract of the report. Requesters may order a microfiche copy of the document or an enlarged paper copy. In most instances, the microfiche copies cost substantially less than the paper reproductions.