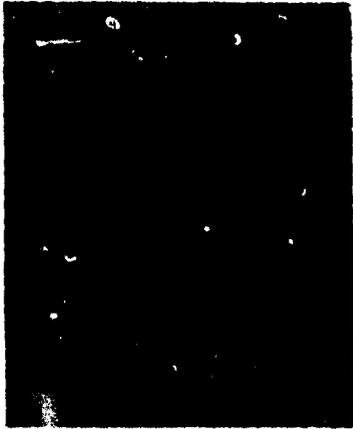


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Technical Report

AD 640 104

MECHANIZATION STUDY  
OF THE U. S. ARMY  
NATICK LABORATORIES  
TECHNICAL LIBRARY,  
NATICK, MASS.

Submitted to

Defense Supply Agency  
Defense Documentation Center  
Cameron Station, Virginia

by

Booz, Allen Applied Research Inc.  
4733 Bethesda Avenue  
Bethesda, Maryland 20014

Under Contract No. DSA-7-15489

BAARINC Report No. 914-1-7

September 1966



BOOZ-ALLEN APPLIED RESEARCH INC.

WASHINGTON  
CLEVELAND  
CHICAGO  
LOS ANGELES

## ABSTRACT

The Library at the Natick Laboratories uses EAM punched card sorting techniques in circulation control and in the generation of master holdings lists of periodicals and journals, subscription renewal, binding lists, and a current titles checklist. The EAM punched cards are also being applied to a survey of title usage. A Flexowriter tape is used to produce catalog cards. Also in process is the subject indexing of the Laboratories' notebooks on EAM cards. Under the Army Technical Library Improvement Study, the Natick Library has been assigned responsibility for a pilot SDI study, matching new acquisitions against user profiles. This program will probably use the Laboratories' GE 225 computer. Future plans call for the introduction of the Southern Illinois University system of circulation. Consideration is also being given to the introduction of a computer and the IBM 870 system which will greatly diminish the Library's dependence on Natick's central computer section. Realization of these plans will depend upon the growth of the Library's responsibilities, the addition of professionals to the Library's staff, and available space within the Library for the necessary equipment.

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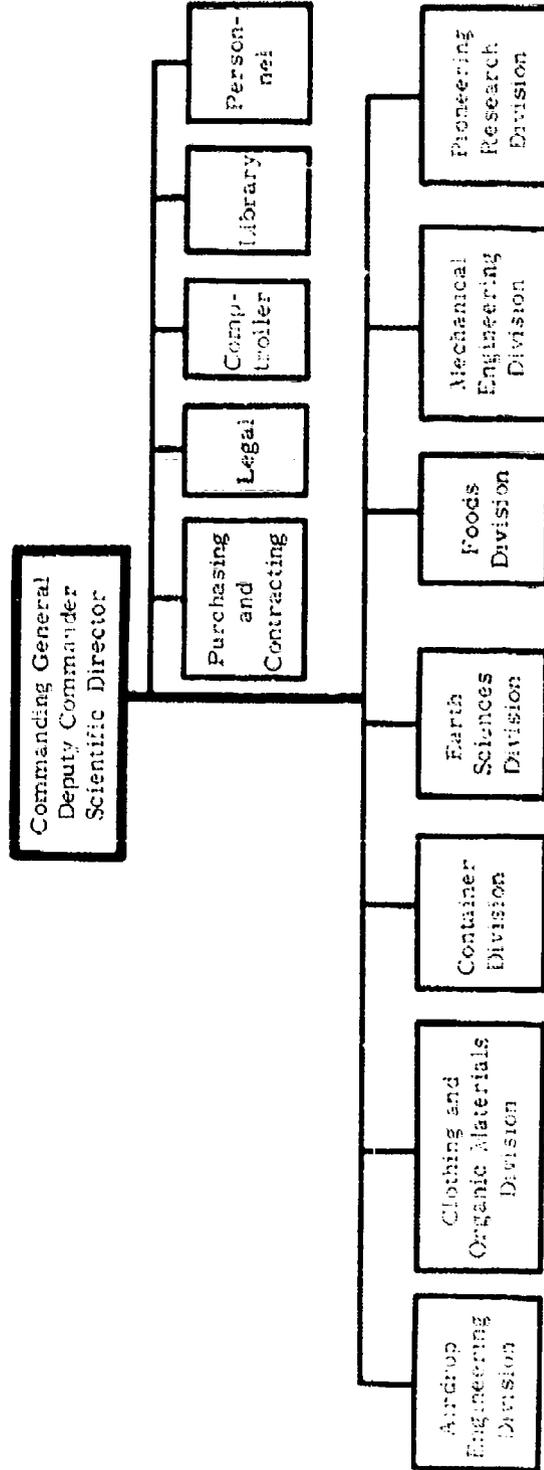
## 1. OVERALL VIEW OF THE LIBRARY

### 1. LIBRARY PROFILE

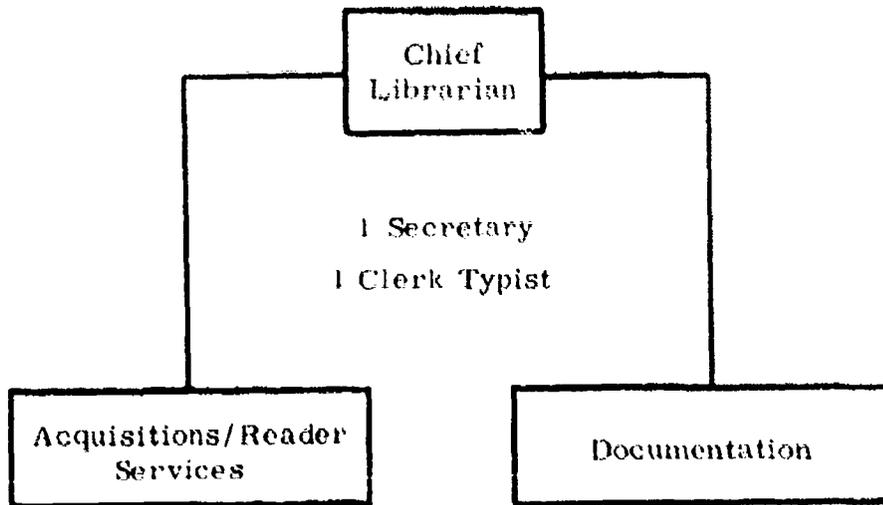
The organization of the U. S. Army Natick Laboratories' Library is presented on the following three pages. Contemporary status of the mechanization of Library activities is given in Table 1. The size and scope of the Library's collection and the mechanization of this collection are shown in Table 2, and a breakdown of the Library's collection by COSATI subject categories is contained in Table 3.

The Library's collection, numbering somewhat more than 41,000 volumes, 75,000 unpublished research reports, and over 1,000 periodical titles, supports the Laboratories' research and development work primarily in the areas of airdrop engineering, clothing and organic materials, containers, earth sciences, food, general mechanical engineering, and basic research. This hard-copy collection is supplemented with microcards, microfilm, microfiche, reprints, photostats, translations, and maps.

U. S. ARMY NATICK LABORATORIES  
ORGANIZATION CHART



U. S. ARMY NATICK LABORATORIES  
 ORGANIZATION OF  
 TECHNICAL LIBRARY PERSONNEL

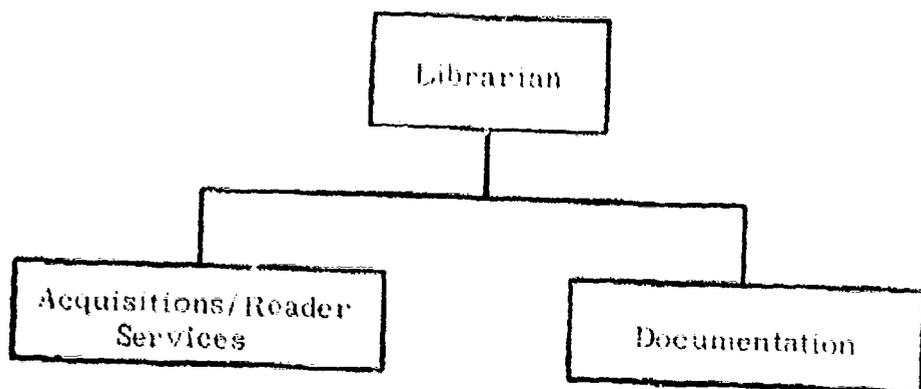


- 1 Librarian
- 3 Library Assistants
- 1 Library Assistant\*
- 1 Clerk Typist (Temporary)
- 1 Enlisted Man (Temporary)

- 1 Supervisory Librarian
- 2 Librarians (Cataloging)
- 1 Librarian (Reference)
- 1 Library Assistant\*
- 1 Clerk Typist

Vacancies.

U. S. ARMY NATICK LABORATORIES  
ORGANIZATION OF ACTIVITIES



- Select books, periodicals, other publications
- Obtain approval of expenditure, need-to-know
- Order books, periodicals, other publications
- Check in periodicals, match and inspect shipment
- Answer ready reference questions
- File/circulate books, periodicals, reports
- Circulate classified reports
- Perform interlibrary loan transactions
- Maintain borrower's file
- Control classified reports, receiving, downgrading, destruction, inventory
- Take inventory of periodical/book collection
- Perform statistical accounting

- Receive technical reports on distribution or special request
- Assign control or accession numbers
- Prepare main entry/subject catalog cards
- Order printed catalog cards for books
- Maintain catalog authorities
- Assign subject heading terms (books, reports)
- Assign classification numbers (books)
- File entries
- Prepare bibliographies
- Perform literature searches
- Translate technical articles
- Prepare/distribute list of acquisitions
- Perform statistical accounting

Table 1  
Mechanization Status of Library Activities

Activities	Not Mechanized	Planned	Under Development	Developed	Operational
<b>Acquisition</b>					
Select books, periodicals, other publications	x				
Obtain approval of expenditure; need-to-know	x				
Order books, periodicals, other publications					x <sup>1</sup>
Check in periodicals; match and inspect shipment	x				
Receive technical reports on distribution or special request	x				
<b>Storage; Catalog and Classification</b>					
Assign classification numbers	x				
Assign control or accession numbers	x				
Prepare main entry/subject catalog cards	x				
Order printed catalog cards for books	x				
Maintain catalog authorities	x				
Assign subject heading terms (books/reports)	x				
Perform subject indexing for periodical articles					
Prepare abstracts or analytical notes					
File entries	x				
<b>Reference and Retrieval</b>					
Answer ready reference questions	x				
Prepare bibliographies	x				
Maintain specific area reference files					
Maintain user interest profiles					
Perform literature searches	x				
Translate technical articles	x				
<b>Circulation</b>					
Route new issues of periodicals					
File/circulate books, periodicals, reports					x
Circulate classified reports					x
Perform interlibrary loan transactions	x				
Maintain borrower's file					x
Prepare/distribute list of acquisitions	x				
Duplicate/circulate Table of Contents for periodicals <sup>2</sup>					
<b>Inventory and Accountability</b>					
Control classified reports; receiving, down grading, destruction, inventory	x				
Take inventory of periodical/book collection	x				
Perform statistical accounting	x				
<sup>1</sup> Periodicals only. <sup>2</sup> <u>Current Contents</u> circulated.					

Table 2  
Scope, Size, and Mechanization Status of Library's Collection

Category of Collection	Size of Collection				Mechanization Status				
	Items per Category	Annual Increase	Annual Usage		Not Mechanized	Planned	Under Development	Developed	Operational
			Reference	Circulation					
Books	15,000 to 17,000	2,000 to 2,500		8,452					x <sup>1</sup>
Periodicals (Bound Volumes)	914 to 1,000 titles 25,000	25		6,400					x <sup>2</sup>
Unclassified Technical Reports	65,000 to 75,000	5,000 to 7,000		1,540					x <sup>3</sup>
Classified Technical Reports	2,000								
Laboratories' Notebooks	5,000	412		412					
			Total reference requests and bibliographies - 1,600						

<sup>1</sup> E.A.M punched cards for circulation.

<sup>2</sup> E.A.M punched cards for circulation and periodical records.

<sup>3</sup> Flexowriter used to prepare catalog cards.

**Table 3**  
**Breakdown of Collection by COSATI Subject Category**

**Table 3**  
**Breakdown of Collection by COSATI Subject Category\***

COSATI Subject Categories	Category of Collection			
	Books	Periodicals	Technical Reports	
			Unclassified	Classified
Aeronautics	1	1	1	1
Agriculture				
Astronomy and Astrophysics				
Atmospheric Sciences				
Behavioral and Social Sciences	1	1	1	1
Biological and Medical Sciences	1	1	1	1
Chemistry	1	1	1	1
Earth Sciences and Oceanography	1	1	1	1
Electronics and Electrical Engineering	3	3	3	3
Energy Conversion (Non-Propulsive)				
Materials	2	2	2	2
Mathematical Sciences	2	2	2	2
Mechanical, Industrial, Civil, and Marine Engineering	2	2	2	2
Methods and Equipment	3	3	3	3
Military Sciences	3	3	3	3
Missile Technology				
Navigation, Communications, Detection, and Countermeasures				
Nuclear Science and Technology	1	1	1	1
Ordnance	3	3	3	3
Physics	1	1	1	1
Propulsion and Fuels	3	3	3	3
Space Technology	2	2	2	2
* The major portion of the Library's collection is indicated by arabic number one; two and three indicate the smaller portions, respectively.				

Periodicals are not circulated, but article copies (Xerox process) of these may be obtained on request. The more important of the titles are regularly bound for future reference. Current issues and bound volumes are available on open shelves.

Technical reports may originate from the Laboratories, the Laboratories' contractors, other activities with related fields of interest, or, by special request, from DDC and other agencies.

Within the Library, acquisitions, circulation, ready reference, and classified report control are accomplished by the Acquisitions/Reader Services Section. The Documentation Section handles all cataloging, including books and periodicals literature searching, and translating.

The Library card catalog, in conjunction with published indexes and bibliographies, is the key to the location of printed materials.

Mechanized processes have been applied to circulation control, periodical renewal control, binding lists, a holdings list of periodicals and journals, and a current titles checklist. A Flexowriter is used to produce catalog cards when Library of Congress cards are not available. The Flexowriter is also used for other miscellaneous typing chores such as typing on EAM cards for a current journal usage survey project.

### 3. USER SERVICE PROFILE

The Library serves the total Natick Laboratories' population. Of this number, 54 percent are considered regular users, and of these regular users, 95 percent are scientists and engineers, and 5 percent are administrative and managerial personnel.

Requests from administrative and managerial personnel are for specific items, translations, and general ready reference items; the frequency of these requests occurs in the order in which they are listed. Engineers and scientists request specific items, ready reference, translations, title listings, and abstracts; again, the frequency of these requests occurs in the order in which they are mentioned. Table 4 indicates

Table 4  
Methods of Request for Library Services\*

Service	Telephone	Memo	Library Request Form	Personal Visit
Specific Items	2	4	3	1 <sup>1,2</sup>
Title Listings	2	3	—	1 <sup>2</sup>
Abstracts	2	4	3	1 <sup>1</sup>
Translations	2	3	—	1 <sup>2</sup>
Ready Reference	2	3	4	1 <sup>2,3</sup>
Request for Duplicates	2	4	3	1 <sup>2,3</sup>

\* Numbers in descending order indicate frequency of method for each service, e.g., 1 indicates most frequent.  
<sup>1</sup> Self-service.  
<sup>2</sup> Library staff assistance.

the various methods that are used to request these services and the frequency of each method. Requests for literature searches are generally forwarded to DDC. Table 5 indicates the subject areas of interest to the principal library users.

Of the outside libraries that borrow from the Natick Library, 50 percent are government, 49 percent are contractors, and 1 percent are public libraries. Books and periodicals loaned to outside libraries average 112 a year.

The principal libraries from which Natick borrows are the National Library of Medicine and the libraries at Harvard and the Massachusetts Institute of Technology. Each year, the Natick Library borrows approximately 300 books and periodical references (reprints requested in most cases).

### 3. GENERAL DESCRIPTION OF PROCESSES

#### (1) Books

Any user may request a book by completing a Form 519 (used for either purchase or loan). When the request is for purchase, approval is obtained and a purchase request is forwarded through procurement to an agent.

**Table 5**  
**COSATI Subject Category Usage**

COSATI Subject Categories	Type of User		
	Administrative	Managerial	Scientists and Engineers
Aeronautics			
Agriculture			x
Astronomy and Astrophysics			
Atmospheric Sciences			
Behavioral and Social Sciences	x	x	x
Biological and Medical Sciences			x
Chemistry			x
Earth Sciences and Oceanography			x
Electronics and Electrical Engineering			x
Energy Conversion (Non-Propulsive)			
Materials			x
Mathematical Sciences	x		x
Mechanical, Industrial, Civil, and Marine Engineering			x
Methods and Equipment		x	x
Military Sciences	x		x
Missile Technology			
Navigation, Communications, Detection, and Countermeasures			
Nuclear Science and Technology			x
Ordnance			x
Physics			x
Propulsion and Fuels			x
Space Technology			x

Upon receipt, the books are checked in, sent to cataloging, and the requester is notified. In cataloging, Library of Congress cards are ordered, classified books are labeled accordingly, and the books are shelved. Books are cataloged according to the Library of Congress classification scheme and are usually given two to four subjects.

The card catalog is divided by author, title, and subject and is open to all Library users. Books are checked out through the circulation system. EAM punched cards containing the call number, author's name, due date, and the borrower's code are used for circulation control. Interlibrary loans are carried out as required.

Lists of new acquisitions are included in the listing for reports which are circulated to the users.

(2) Periodicals and Journals

Users may request a subscription to a new periodical title. Ordering procedures follow in much the same manner as those for books, and Library of Congress cards are similarly ordered.

At present, a listing of the periodical collection is on EAM punched cards. These cards are used to generate a listing (master) of all periodicals in the Library, a renewal listing for titles currently being received, a binding list, and a current titles checklist.

Upon receipt, the periodicals are checked in on a Kardex file and missing issues are reordered. The Library performs abstracting or indexing on this collection. A subject approach to the title held by the Library is available in the main book catalog via the Library of Congress cards and recommended subject headings.

Periodicals are not routed or circulated; however, an issue may be removed from the Library long enough for article reproduction. Two copies of Current Contents are routed as an indication to users of newly published articles.

### (3) Technical Reports

Technical reports are received on automatic distribution from other laboratories, contractors, and related outside activities. They are reviewed for pertinency and value to the collection

before being added to the collection. Reports are also obtained on special request from DDC or other sources. Approximately 75 percent of the reports in the collection originate within the laboratories; space limitations have imposed restrictions on adding other agency reports to the collection held for permanent reference.

Bibliographic data are punched on Flexowriter tape by the cataloger using a simple catalog card format. This tape is then used to generate all catalog cards in the files except for those cards furnished with the reports. Reports are indexed according to the DDC thesaurus or the Library's subject authority file. Natick reports receive full cataloging, other reports do not. On the average, 14 terms are assigned to each report.

Cards generated by the Flexowriter are arranged by subject and by author-title-series and are filed in the open catalog.

A list of new accessions is circulated to the staff indicating new Laboratories' reports, contractor reports, and other agency reports. Reserves may be placed on items desired from this listing as well as for items included in the book section.

The card catalogs are open for reference. Requests for bibliographic searches are handled by the Documentation Section and generally are supplemented by DDC searches.

Requests for translations of European languages are handled by two members of the Library staff. Requests for translations of other languages are sent out on contract through the regular procurement channels. Normal sources of items already translated are used whenever possible.

Technical reports are stored in open shelving in the Library stacks. Microcard, microfilm, and microfiche are included in the shelf list and film readers are available.

Reports are circulated through the main circulation system using EAM punched cards in the same manner as books. Technical reports are loaned to other libraries with proper clearances and need-to-know only in rare instances when they are not available through DDC.

#### (4) Classified Documents

Approximately 2,000 Confidential and 10 Secret reports exist in this collection. The majority of these receive only abbreviated cataloging. This classified collection is being diminished

in order to reduce the clerical work involved in maintaining this collection in accordance with security regulations.

The classified reports are handled by the Acquisitions/Reader Services Section rather than the Documentation Section and are processed and circulated in the same manner as described above, subject to normal security regulations. Included in this collection are the Laboratories' notebooks.

## II. MECHANIZATION

### I. MECHANIZATION SUMMARY

EAM punched card-sorting techniques are used in circulation control and in the generation of master holdings lists of periodicals, subscription renewal, binding lists, and a current titles checklist. The periodical listings using EAM punched cards began in July 1962, circulation control using the cards began in May 1965. A Flexowriter tape is used to produce catalog cards and other miscellaneous typing tasks.

The EAM punched cards are also being applied to a survey of title usage. In this survey one card per issue is made and, using the Flexowriter, is provided with special typewriter instructions. A user of a title is expected to initial the card.

Also in process is the subject indexing of the Laboratories' notebooks on EAM cards.

A library staff member spends half a day twice a week punching EAM cards. The Flexowriter is used full time.

Equipment presently used for the EAM processing consists of the IBM 026 card punch, IBM 082 sorter, and a reader-printer. The usual problems associated with changeover to EAM punched-card systems were greatly reduced as a result of close coordination between the staff and IBM representatives.

## 2. MECHANIZED PROCESSES

(1) Circulation control is accomplished by providing each book with a punched card in the following format.

<u>Card Columns</u>	<u>Contents</u>
1-25	Author's Name
26-63	Library of Congress Call Number

A borrower signs his name and organization on the punched card. This card is filed under the author's name. The Library then has a new card produced from the original in the following format

<u>Card Columns</u>	<u>Contents</u>
1-25	Author's Name
26-63	Library of Congress Call Number
64-72	Due Date
73-80	Borrower's ID Code

The printed top of the card appears:

ANDREWS    QA476.A7    2A65    1    1240.

The coded due date shown is August 2, 1965, and the borrower's code is Division 1, ID No. 1240. This new card is then filed under the borrower's code and is used to print recall notices and circulation statistics.

(2) Periodical Cards

The master deck of EAM punched cards, which contains the periodical information, produces the four lists described below:

Binding List -- This is a listing of the titles to be bound; it is used to select and pull issues for the bindery and to check in the returned bindings.

Master List of Periodicals -- This is a listing of all periodical titles in the Library including completed file beginning and ending dates, current file beginning dates, and the number of copies received. A sample sheet from this listing is shown in Table 6.\*

---

\* Since the other three lists are very similar to this master list, samples are not shown.

Table n  
Sample of the Master List of Periodicals

FIBRES FABRICS AND CORDAGE	1947-1950	1
FIBRES, INTERNATIONAL SEE FIBRES AND ELASTICS		1
FIBRES NATURAL AND SYNTHETIC SEE FIBRES AND PLASTICS		1
FIELD CROP ABSTRACTS	1955-	1
FINISH SEE METAL PRODUCTS MANUFACTURING		1
FISCHEREIWELT SEE FISCHWIRTSCHAFT		1
FISCHWIRTSCHAFT*	1952-1953	1
	1955	2
FISH BOAT INCLUDING SEAFOOD MERCHANDISING	1952-	1
FISHING GAZETTE	1956-	1
FISHING GAZETTE ANNUAL REVIEW	1953-1954	1
	1956-1958	2
	1961-	3
FIZIOLOGICHESKII ZHURNAL SSSR IM. I. M. SECHENOVA		1
SEE SECHENOV PHYSIOLOGICAL JOURNAL		2
FIZIOLOGIJA RASTENII SEE ENGLISH TRANSLATION UNDER		1
PLANT PHYSIOLOGY USSR.		2
FLAVOR NEWSLETTER	1955-	1
FLAVOURS FRUIT JUICES AND SPICES REVIEW	1946-1948	1
FLEISCH WIRTSCHAFT	1953-1963	1
FLEISCHER-HANDWERK	1953-1954	1
FLIGHT AIRCRAFT SPACECRAFT MISSILES SEE FLIGHT INTERNATIONAL		1
FLIGHT AND AIRCRAFT ENGINEER SEE FLIGHT INTERNATIONAL		1
FLIGHT INTERNATIONAL*	1958-	1
FLIGHT MAGAZINE	1958-	1
FLOW SEE MATERIAL HANDLING ENGINEERING		1
FLYING	1958-	1
FLYING SAFETY SEE AEROSPACE SAFETY		1
FOCUS	1951-	1
FOOD SEE FOOD PROCESSING & PACKAGING		1
FOOD AND COOKERY	1964-	1

Renewal Lists---From the master file, two selected listings of currently received titles are printed, one for domestic items and one for foreign items. Several copies of both lists are sent to procurement to be used in bidding lists to initiate renewal.

Current Titles Checklist---A printing of current titles is routed to users for a checkoff of items the user wishes to be continued.

### 3. FUTURE PLANS

Future plans call for the introduction of the Southern Illinois University system of circulation which essentially works as outlined below:

(1) Due date is entered on a manual entry keyboard (IBM 372) that is attached to a main data-collection unit (IBM 357).

(2) A book card and a borrower's card, which is an ID card containing picture, name, address, ID number, and ID number in machine language, are collected and inserted into the data-collection unit. This action produces two cards, each bearing book information, borrower information, and due date.

(3) One new card is returned with the master book card to the pocket of the book and is used to provide borrower's notice of date due.

(4) The other card is stacked in the machine and serves as the Library's record of the transaction.

Under the ATLIS program (Army Technical Library Improvement Study), the Natick Library has been assigned responsibility for an SDI (Selective Dissemination of Information) study. This program will be run as a pilot study, matching new acquisitions against user profiles, and will probably use the Laboratories' GE 225 computer. It is expected that about 100 participants will be involved in the study. The U. S. Army On-Site Scientific and Technical Information Survey will provide the majority of the profiles, but some new profiles will be added.

In the event that the DoD Information Analysis Centers in Food and Clothing are added to the Library's responsibilities, a computer will probably be employed to support the operation of the Centers.

Future planning in the Library also considers the introduction of the IBM 870 system which is titled "Library Administration Processing System for Federal Government Libraries and Special Information Repositories." This system consists of the 026 card punch, upper / lower-case typewriter printers, and an 836 control unit. Purchase of

the 870 system will greatly diminish the Library's dependence on Natick's central computer section. The following tasks are being considered for this system:

Bibliographies	Announcements
Requisitions	Cataloging
Reference Listings	Accessions Lists
Index Listings	Retrieval of References (reports, memos, reprints)
Circulation Control	Periodical Control
Statistics	Serial Records

Consideration is being given to utilizing the 870 equipment in the fashion of the Raytheon Wayland Lab system which uses punched cards containing title, number, author, subjects, purchase contract, borrower's name and date, and space for miscellaneous added entries. The cards can be used to produce periodical check-in cards, borrower charge inventories, acquisition listings, selective bibliographies, circulation records, and abstract listings. Not yet developed in this system, but considered feasible, are purchase requests, purchase orders, overdue notices, binding orders, binding lists, authority cards, authority listings, and printed catalogs. The Raytheon system can also control books, notebooks, memos, bound and unbound periodicals, and classified or unclassified reports. Paper tape produced by the 870 is compatible with the Flexowriter.

In the opinion of the Library staff, realization of these plans for an 870 system and a computer will depend upon the growth of the Library's responsibilities, the addition of personnel to the Library's staff, and available space within the Library for the necessary equipment.

Unclassified

Security Classification

DOCUMENT CONTROL DATA - RAD

(See instructions on title page of document containing this report)

BOOZ ALLEN APPLIED RESEARCH, INC.  
4733 Bethesda Avenue  
Bethesda, Maryland 20014

Unclassified

Mechanization Study of the U. S. Army Natick Laboratories  
Technical Library, Natick, Mass.

Final Report of on-site survey

G. A. Kershaw, D. Crowder, J. E. Davis, E. G. Loges,  
E. Merendini, S. M. Thomas

September, 1966

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DSA-7-15489

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Defense Supply Agency  
Defense Documentation Center  
Cameron Station, Virginia

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KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
<p><b>Electronic Accounting Machines Libraries Information Systems</b></p>						
<b>INSTRUCTIONS</b>						
<p><b>1. ORIGINATING ACTIVITY:</b> Enter the name and address of the contractor, sub-contractor, grantee, Department of Defense activity or other organization responsible for originating the report.</p>						
<p><b>2. REPORT SECURITY CLASSIFICATION:</b> Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accord with applicable security regulations.</p>						
<p><b>3. GROUP:</b> Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 1 and Group 2 as authorized.</p>						
<p><b>4. REPORT TITLE:</b> Enter the complete report title in all capital letters. Enter in all cases, should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parentheses immediately following the title.</p>						
<p><b>5. DESCRIPTIVE NOTES:</b> If appropriate, enter the type of report, e.g., technical progress, summary, annual, or final, cover the contract or grant number, the reporting period in covered.</p>						
<p><b>6. AUTHOR(S):</b> Enter the number(s) of author(s) as shown on cover of the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.</p>						
<p><b>7. REPORT DATE:</b> Enter the date of the report as day, month, year, or month, year. If more than one date appears on the report, use date of publication.</p>						
<p><b>8. TOTAL NUMBER OF PAGES:</b> The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.</p>						
<p><b>9. NUMBER OF REFERENCES:</b> Enter the total number of references cited in the report.</p>						
<p><b>10. CONTRACT OR GRANT NUMBER:</b> If appropriate, enter the applicable number of the contract or grant under which the report was written.</p>						
<p><b>11. R &amp; B. PROJECT NUMBER:</b> Enter the appropriate military department identification, such as project number, subproject number, system number, task number, etc.</p>						
<p><b>12. ORIGINATOR'S REPORT NUMBER(S):</b> Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to the report.</p>						
<p><b>13. OTHER REPORT NUMBER(S):</b> If the report has been published previously, enter report numbers earlier by the originator. If applicable, also enter other numbers.</p>						
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