AUTOMATED CIRCULATION USING A DATA MANAGEMENT SYSTEM IN THE MEDIUM-SIZED TECHNICAL LIBRARY.

by

Shevra L. Martin

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**Author:** Shevra L. Martin

**Performing Organization:**
David W. Taylor Naval Ship Research and Development Center
Bethesda, Maryland 20084

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**Abstract:**
LIBCRA, an automated circulation system developed for the David W. Taylor Naval Ship Research and Development Center Technical Information Libraries, utilizes the SHARP Data Management System. The following output products are issued: listings of the entire file by author and borrower, inter-library loan records in chronological order of due-date, first and second overdue notices, lost materials records, lists of...

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Individual borrowers holdings, and annual reminder notices to all borrowers listing their holdings. The system is described in terms of file creation, file maintenance, data retrieval, and report definition. A cost analysis is also presented.
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<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
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<tr>
<td>ADP</td>
<td>Automatic data processing</td>
</tr>
<tr>
<td>AUTH/ORG</td>
<td>Author/organization</td>
</tr>
<tr>
<td>DMS</td>
<td>Data management system</td>
</tr>
<tr>
<td>ILL</td>
<td>Inter-library loan</td>
</tr>
<tr>
<td>INDEF</td>
<td>Indefinite loan</td>
</tr>
<tr>
<td>ITEM/ID</td>
<td>Item identification</td>
</tr>
<tr>
<td>LEND/LIB</td>
<td>Lending library</td>
</tr>
<tr>
<td>LIBCRA</td>
<td>Library circulation, Annapolis</td>
</tr>
<tr>
<td>MR</td>
<td>Machine readable</td>
</tr>
<tr>
<td>OCR</td>
<td>Optical character recognition</td>
</tr>
<tr>
<td>REPT/NO</td>
<td>Report number</td>
</tr>
<tr>
<td>SHARP</td>
<td>Ships Analysis and Retrieval Program</td>
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</table>
ABSTRACT

LIBCRA, an automated circulation system developed for the David W. Taylor Naval Ship Research and Development Center Technical Information Libraries, utilizes the SHARP, Data Management System. The following output products are issued: listings of the entire file by author and borrower, inter-library loan records in chronological order of due-date, first and second overdue notices, lost materials records, lists of individual borrowers holdings, and annual reminder notices to all borrowers listing their holdings. The system is described in terms of file creation, file maintenance, data retrieval, and report definition. A cost analysis is also presented.

ADMINISTRATION INFORMATION

This work was performed under overhead. The principal investigator is Shevra L. Martin, Technical and Administrative Services Department, David W. Taylor Naval Ship Research and Development Center (DTNSRDC).

INTRODUCTION

Circulation systems can be roughly classified as either inventory control systems or absence systems. In inventory control systems, the Library's shelf list is converted into machine-readable (MR) form so that only borrower information is required at the time of the transaction. In absence systems, records are stored for materials only while they are absent from the collection. These MR records may be made either before, during, or after the transaction takes place. The latter method, which the DTNSRDC Library employs, has the advantage of requiring neither on-site automatic data processing (ADP) equipment, nor advance preparation of publications.

When a user checks-out a publication, a brief manual record is made of the transaction. After the records batch-up, about once a week, the information is entered on the automated master file via optical character recognition (OCR) forms, key-punched cards, or keyboarding.

Prior to automated circulation, the Library used a manual two-card circulation system. Upon checking out a publication, the borrower would

*References are listed on page 18.
write his name and code (office mailing address) on two cards. The cards would be filed separately; one in an 'author file', the other in a 'borrower file'. Loans may be either short term or indefinite, depending on whether the material was borrowed from the Library's collection, or purchased specifically for departmental use with project funds.

The LIBCRA (Library Circulation) system provides the following capabilities:

- maintenance of a master file of circulation transactions with a two-week or longer due date
- quarterly production of two master file listings; one alphabetically by author, the other alphabetically by borrower
- management of inter-library loans (ILL's)
- automatic renewals and wait lists
- generation of first and second overdue notices
- records management for lost materials
- printing of individual holdings lists for borrowers
- production of annual remainder notices for borrowers with indefinite loans

THE DATA MANAGEMENT SYSTEM (DMS)

A generalized data management system available on the Center's CDC 6700 Computer System was selected. SHARP—Ship's Analysis and Retrieval Program—was developed at DTNSRD in the COBOL procedural language. SHARP is designed to allow non-technical persons to define, build, maintain, and interrogate data bases without requiring application program interfaces. While there are a variety of data base applications under the SHARP DMS, including technical document information retrieval, ship overhaul experience, computer center accounting, and Ocean Science Research Project Information, LIBCRA is the first such application for document circulation.
In the March 1975 issue of Special Libraries, Mr. K.A. Collins discusses the advantages of a DMS for Special Library use. SHARP and LIBCRA will be discussed in terms of Collins' four basic DMS categories:

(i) file creation
(ii) file maintenance
(iii) data retrieval
(iv) report generation

FILE CREATION

A SHARP user data base consists of one or more data files (LIBCRA uses only one file). Each file consists of a collection of logical records. Each logical record contains information which describes a different entity in the data file. In LIBCRA, each logical record represents a single circulation transaction.

The initial task in building the data base was to define the various elements that might occur in any one logical record. While there are fifteen possible LIBCRA data elements, the average record will use only five or six. The following is a brief explanation of each data element (each element acronym is preceded by its data element number).

0) RECORD KEY

Each record must have a unique descriptor which allows it to be distinguished from other records in the file. This record key is a serially assigned number from 1 to 9,999,999.

1) ITEM/ID

This is a numeric or alphanumeric code which uniquely identifies the circulating item, usually the LC call number or report accession number.

2) AUTH/ORG

This is the main entry.

3) TITLE

This may be entered in abbreviated form.
4) REPT/NO

The Report Number is optional and is used only when the Circulation Technician feels that it would help a user to identify a report should it be recalled.

5) BORROWER

To ensure standardization, the Center Telephone Directory is used as a guide for the proper entry of the borrower's name.

6) CODE

This is the office mailing address of the borrower.

7) DUE/DATE

This is used only for short-term (three-month) loans.

8) INDEF

This element, which can only have the value "INDEF", is used for departmental loans.

9) FORM

This optional element is used only for materials with an unusual form, such as film or kit.

10) ILL

The Inter-Library Loan notification can have either one of two values: an "L" for a publication loaned to another library, or a "B" for a publication borrowed from another library.

11) LEND/LIB

Used in conjunction with data element ten above, LEND/LIB identifies the source of the borrowed item.

12) LOST/INFO

The value "LOST" is entered into a record when the item is reported missing by the borrower.

13) RESERVE

This element may only have the value "RESERVE".
14) WAIT/LIST

This is a repeating element that can accommodate up to three names and codes and is only used if element thirteen is also used.

15) REMARKS

This element may be used for a Library staff member's message, such as to discard an old edition when returned, or to have it recataloged. Like WAIT/LIST, it is used only when element thirteen is used.

After defining the data base, the next step was to convert the information from our old file of borrowers cards into SR form. In order to guarantee standardization in data entry, all entries were made according to precise instructions which were later incorporated into a user's manual.

All conversion work was performed on an OCR machine. When conversion of older records began, we also started recording current transactions on the master file. When conversion was completed, both manual and automated systems were used simultaneously for a three-month trial period. During that time, the various reports were generated and edited and all query sequences were tested and debugged.

FILE MAINTENANCE

SHARP can be updated by adding records, changing or adding a data element within an existing record, or by deleting records. We use adds for entering new circulation transactions on the master file, changes for renewals, reserves, wait lists, etc., and deletes for removing records from the master file for returned materials.

Material is circulated from three points within the Library: the circulation desk, the inter-library loan desk, and the new acquisitions desk. Whenever material is circulated, information about the publication and the borrower is hand-written on a pre-printed form. Once a week, the information from these forms is copied on OCR forms and forwarded to the Computer Services Department for scanning. Since ILL records are so transient, they are entered on the master file directly at the terminal.
In order to delete a record from the master file for returned material, one need only enter the RECORD KEY preceded by "D" for delete. The RECORD KEY for the item is found by searching the Record Number Index (Figure 4) under the publication's ITEM/ID (LC call number or report accession number). Once deleted, a RECORD KEY may be re-used.

To renew an item for longer than the usual three-month loan period, one need only enter a "C" for change, the RECORD KEY, and the new due date preceded by its data element number.

Reserving material is more complicated. Since there are no borrowers cards in the automated system, the reserve notification appears on the Record Number Index in the Reserve column alongside the publication's ITEM/ID. When the Record Number Index is searched for a returned item's RECORD KEY, the reserve message will alert the Librarian not to reshelve the item. The reserver's name and code can then be looked up in the complete record for the transaction which appears in the Master File/Author Report (Figure 1). In order to enter reserve information in a record, one enters a "C" for change, the RECORD KEY, the word RESERVE preceded by data element number thirteen, and the reserver's name and code preceded by data element number fourteen.

Other changes, additions, and deletions to records are made by using one or a combination of these update commands.

DATA RETRIEVAL

Queries to the data base can be made either online at the terminal, or offline via a job control punched-card deck. Online queries may be entered in either an interactive or batch terminal mode. In the interactive mode, the user enters a query and monitors the job during the entire execution of a query job from query input to query output. In the batch terminal mode, the query is entered and then the user is asked to specify whether the query results (the number of hits, not to be confused with query output) are to be displayed online at the terminal or
to an off-line printer. The user then logs off the terminal and waits an average of 30 minutes before logging back on to receive the results.

For both the interactive and batch terminal modes, the system determines the number of hits for each question entered. The user then specifies whether or not the hit records should be printed on-line, off-line, or not printed at all.

Since most circulation queries have a large expected output and are not required for immediate use, they are usually submitted off-line via punched deck. With few exceptions, these query decks are submitted according to a pre-determined schedule.

**REPORT GENERATION**

All LIBCRA queries contain a report statement which identifies a previously defined report. Records selected in the search will then be output in one of five formats which were specified when the reports were defined.

**MASTER FILE/AUTHOR REPORT**

The Master File/Author Report is the most important listing for retrieval purposes. When a user identifies a title of interest in the catalog or new accessions bulletin which he cannot locate on the shelf, he searches the Master File/Author Report for the borrower's name and the due date. This Report consists of the entire master file in alphabetical order of main entry, title, and borrower. The query is submitted quarterly. See Figure 1.

**MASTER FILE/BORROWERS REPORT**

The Master File/Borrowers Report, Figure 2, lists the entire master file in alphabetical order of borrower's name, main entry, and title. It is used primarily in clearing employees who are checking-out of the Center. The query is submitted semiannually.
INDIVIDUAL LOAN TRANSACTIONS

A listing of Individual Loan Transactions, which is used for the same purpose as the Master File/Borrowers Report, is issued on a demand basis only. A search is made for all of the loan holdings of a particular borrower, and it reports the results by author's name and title. Since query output is small, the query may be submitted via punched deck or directly at the terminal in the online interactive mode. See Figure 3.

RECORD NUMBER INDEX

The Record Number Index, Figure 4, serves a dual purpose. First, it serves as a locator for RECORD KEYS for returned material. Second, it alerts the Librarian when an item had been previously reserved. The Index, which is in columnar form, lists the ITEM/ID's with their corresponding RECORD KEYS and, if applicable, reserve notifications. The report is generated monthly.

OVERDUE NOTICES

Both first and second overdue notices are sent monthly to delinquent borrowers. All short-term loans are due on the fifteenth of the third month from date of check-out. The overdue notices are issued on the thirtieth day of the third month from check-out date to allow a two-week "grace period". The queries search on DUE/DATE and report each borrower's overdues on a separate page with the mailing address at the top in memo format. See Figure 5.

According to Center Regulations, the Library is required to issue annual reminder notices to borrowers of indefinite loans. To accomplish this, a query is submitted at the year's end which searches for records with the value INDEF in data element eight that hadn't been recorded lost. The notice is similar in appearance to the overdue notices.

INTER-LIBRARY LOAN RECORD

Figure 6 is a sample page from the Inter-Library Loan Record. This weekly report is used for keeping track of all inter-library loan matters
including recalling loans from users by phone before they are due, recording renewals, etc. The query searches the master file for records in which the value "B" appears in data element ten. The results are arranged chronologically by due date and then alphabetically by borrower's name to facilitate recalls.

COST ANALYSIS

In attempting to provide a cost analysis, several mistakes in project management became apparent. First, monthly cost accounting worksheets which showed charges transferred from Library funds into Computer Services funds were sent to the Library budget manager instead of the Library automation project leader. Second, there was no way of differentiating between charges expended for regular operating costs, development costs, computer personnel labor costs, or the program users fee. To rectify this, separate funds have been established for each cost category.

Since we cannot break out the weekly accounting sheets by cost category, the cost analysis in Table 1 will suffice to show only projected annual operating costs based on averaging several typical months of operation.

CONCLUSION

In order to evaluate the success of the system, we must measure how well automation has enabled us to meet our goal of better control over the whereabouts of Library materials. To state this in quantifiable terms—is the number of first and second overdue notices sent each month and the number of items reported missing each month decreasing? Statistics will be kept for one year as part of an evaluation program.

In addition to better circulation control, automation has provided us with other advantages as well. Because of the large volume of indefinite loans out on circulation, it had never been feasible under the manual system to send annual reminder notices to borrowers of indefinite loans. The response to the first set of indefinite loan reminder notices issued
under the automated system has been enthusiastic. For the first time in
the Center's eighty-year history, each employee received a list of all of
the publications he had purchased. Many borrowers returned titles they no
longer needed (and in many cases they had forgotten about), thereby putting
hundreds of titles back in circulation.

Probably the greatest benefit derived from the project was in the
area of staff development. During the system design phase of the project,
the staff participated in flow charting and in determining the various
data elements in the logical record. During data conversion, they re-
ceived training in and became proficient in the use of the OCR and Key-
punch machines. During the trial period, each staff member was responsible
for editing and correcting her computer output, and for communicating
problems directly to computer personnel. As part of daily operating pro-
cedures, staff members perform updates either directly at the terminal
keyboard or via punched-deck, they merge and purge the holdings file at
the terminal, and they submit queries and generate reports. In fact, the
system is now totally operated and maintained by the Library staff with-
out any intervention from the Supervisor.

After a successful experience with this relatively straightforward
project, the Library staff is now prepared to embark upon another more
complicated automation program, the development of a data bank of Library
holdings with online retrieval capabilities.

ACKNOWLEDGMENT

The author wishes to acknowledge the assistance provided by Judith
Lanham, Judith Fleming, and Suzanne Grabowski of the DTNSRDC Technical
Information Library.
AUTHOR RECORDS
MASTER FILE OF CIRCULATION TRANSACTIONS

REPORT AUT UT 001 JUN 25 1976

AUTH/ORG AICHE
GVC/AICHE-JOINT MEETING AND/UND JAHRESTREFFEN...
BORROWER WHITE E W 2831
TP 155.7 A 51V.3 INDEF

0007335

AUTH/ORG AICHE
GVC/AICHE-JOINT MEETING AND/UND JAHRESTREFFEN...
BORROWER WHITE E W 2831
TP 155.7 A 51V.4 INDEF

0007336

AUTH/ORG AICHE
GVC/AICHE-JOINT MEETING AND/UND JAHRESTREFFEN...
BORROWER WHITE E W 2831
TP 155.7 A 51V.5 INDEF

0007337

AUTH/ORG AICHE
SAFETY IN HIGH PRESSURE POLYETHYLENE PLANTS
BORROWER MC QUAID R W 2831
TP 55.3 H 6 A 51V.1 INDEF

0005161

AUTH/ORG AICHE
SAFETY IN POLYETHYLENE PLANTS
BORROWER MC QUAID R W 2831
TP 55.3 H 6 A 51V.1 INDEF

0005162

AUTH/ORG AIR FORCE AERO PROPULSION LAB
ASSESSMENT OF POLLUTANT MEASUREMENT AND CONTROL...
BORROWER HERSHNER C H 2705
UD06807 INDEF LOST

0003396

AUTH/ORG AIR FORCE AERO PROPULSION LAB
FUEL DATA STANDARDIZATION STUDY FOR JP-4, JP-5...
BORROWER VENTRIGLIO D R 2804
UD06993 INDEF

0006993

AUTH/ORG AIR FORCE AERO PROPULSION LAB
STUDY OF ESTIMATION METHODS FOR HYDROGEN CONTENT...
BORROWER VENTRIGLIO D R 2804
UD17184 DUE/DUE: JUN 15 76

0007695

Figure 1 — Sample Page from Master File/Author Report
(QUERY UT IN REPORT FORMAT AUT)
BORROWER RECORDS
MASTER FILE OF CIRCULATION TRANSACTIONS

REPORT BWR WP 001

BORROWER: BOWEN R J
AUTH/ORG: TYCO LABORATORIES INC
HYDROGEN-NICKEL REGENERATIVE FUEL CELLS
U015360

BORROWER: BOWEN R J
AUTH/ORG: WILSON
INTRODUCTION TO SCIENTIFIC R.
6123

BORROWER: BOWEN R J
AUTH/ORG: YARDNEY ELECTRIC CORP
EVALUATION OF IMPROVED SEPARATOR MATERIAL IN LARGE SILVER...
U013596

BORROWER: BOWEN T L
AUTH/ORG: ATLANTIC RESEARCH CORP
HAZARDS OF LIQUID HYDROGEN IN RESEARCH AND...
U011237

BORROWER: BOWEN T L
AUTH/ORG: BUREAU OF MINES
REVIEW OF FIRE AND EXPLOSION HAZARDS OF FLIGHT...
U011514/C.2

BORROWER: BOWEN T L
AUTH/ORG: BUREAU OF MINES
REVIEW OF FIRE AND EXPLOSION HAZARDS OF...
U011514

BORROWER: BOWEN T L
AUTH/ORG: LITTLE ARTHUR D INC
FINAL REPORT ON AN INVESTIGATION OF HAZARDS...
U011239/C.2

BORROWER: BOWEN T L
AUTH/ORG: LITTLE ARTHUR D INC
ON AN INVESTIGATION OF HAZARDS ASSOCIATED...
U011249/C.3

Figure 2 — Sample Page from Master File/Borrowers Report
(Query WR in Report Format BWR)
<table>
<thead>
<tr>
<th>Record ID</th>
<th>Title</th>
<th>Borrower Code</th>
<th>Due Date</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>0002386</td>
<td>TEACH YOURSELF NAVAL ARCHITECTURE</td>
<td>GORE J L</td>
<td>1140</td>
<td>INDEF</td>
</tr>
<tr>
<td>0002386</td>
<td>NOISE REDUCTION</td>
<td>GORE J L</td>
<td>1140</td>
<td>INDEF</td>
</tr>
<tr>
<td>0007828</td>
<td>AT CLOSE QUARTERS; PT BOATS IN THE U.S. NAVY</td>
<td>GORE J L</td>
<td>1140</td>
<td>INDEF</td>
</tr>
<tr>
<td>0007828</td>
<td>AT CLOSE QUARTERS; PT BOATS IN THE U.S. NAVY</td>
<td>GORE J L</td>
<td>1140</td>
<td>INDEF</td>
</tr>
<tr>
<td>0002390</td>
<td>PILOTING, SEAMANSHIP AND SMALL BOAT HANDLING</td>
<td>GORE J L</td>
<td>1140</td>
<td>INDEF</td>
</tr>
<tr>
<td>0002394</td>
<td>MANAGEMENT, TASKS, RESPONSIBILITIES, PRACTICES</td>
<td>GORE J L</td>
<td>1140</td>
<td>INDEF</td>
</tr>
<tr>
<td>0002396</td>
<td>HIGH-SPEED SMALL CRAFT</td>
<td>GORE J L</td>
<td>1140</td>
<td>INDEF</td>
</tr>
<tr>
<td>0002400</td>
<td>SEAMANLIKE SENSE IN POWERCRAFT</td>
<td>GORE J L</td>
<td>1140</td>
<td>INDEF</td>
</tr>
</tbody>
</table>

Figure 3 – Sample Page from Individual Loan Record
(Query IDV in Report Format AUT)
## Record Number Index

### Report NoX DX 001

<table>
<thead>
<tr>
<th>ITEM ID</th>
<th>RESERVE</th>
<th>RECORD</th>
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<tbody>
<tr>
<td>QA 76 Y 811972</td>
<td></td>
<td>0001640</td>
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<tr>
<td>QA 76.5 D 231975</td>
<td></td>
<td>0002497</td>
</tr>
<tr>
<td>QA 76.6 D 131972</td>
<td></td>
<td>0001589</td>
</tr>
<tr>
<td>QA 76.8 I 12 B 871975</td>
<td></td>
<td>0001583</td>
</tr>
<tr>
<td>QA 807.08</td>
<td></td>
<td>0005076</td>
</tr>
<tr>
<td>QA 901.8 5</td>
<td></td>
<td>0005049</td>
</tr>
<tr>
<td>QA 901.9 8</td>
<td></td>
<td>0005041</td>
</tr>
<tr>
<td>QA 913 A 9121971C.2</td>
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<td>0002082</td>
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Figure 4 — Sample Page from Record Number Index
(Query DX in Report Format NoX)

14
**********LISTING OF OUTSTANDING LIBRARY MATERIAL**********

THE FOLLOWING OVERDUES SHOULD BE RETURNED TO THE LIBRARY.

TO RENEW A TITLE, BRING IT TO THE CIRCULATION DESK.

INDICATE HERE ANY LOST ITEMS AND RETURN FORM TO CODE 5222.

REPORT OVD FN 001

BORROWER: SACK B P

DUE/DATE: JAN 15 76
AUTH/ORG: NTIS
MAGNETOHYDRODYNAMIC GENERATORS...
U815329

DUE/DATE: DEC 15 75
AUTH/ORG: WEBB INST OF NAVAL ARCH
FUEL CONSERVATION IN SHIP OPERATIONS
U814630

Figure 5 - Sample First Overdue Notice
(Query FN in Report Format OVD)
RECORD OF INTER-LIBRARY LOANS
BORROWED FROM OUTSIDE LIBRARIES

REPORT DLIB BL0001

JUN 04 1976

RECORD

DUE/DATE: JUL 02 76 UNM0
BORROWER: MONTEMARANO J A 2053
INTERFACE IN POLYMER MATRIX COMPOSITES VOL 6
AUTH/ORG: PLUEDDELMANN
CHM44 418.9 C 6 P 55
DEADLINE 28 JUNE 76

DUE/DATE: JUL 02 76 UNM0
BORROWER: MONTEMARANO J A 2053
STRUCTURE AND PROPERTIES OF ORIENTED POLYMERS
AUTH/ORG: WARD
CHMJD 381 W 371975
DEADLINE 28 JUNE 76

Figure 6 — Sample Page from Inter-Library Loan Record
(QUERY BLB in Report Format DLIB)
<table>
<thead>
<tr>
<th>Purpose</th>
<th>Cost in dollars for Single Event</th>
<th>Estimated Number Events per Year</th>
<th>Cost in Dollars per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactive for ILL</td>
<td>15</td>
<td>52</td>
<td>780</td>
</tr>
<tr>
<td>Scans for batch jobs</td>
<td>15</td>
<td>52</td>
<td>780</td>
</tr>
<tr>
<td>Queries and Reports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual loan holdings</td>
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<td>60</td>
<td>255</td>
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<td>First and Second Overdue Notice</td>
<td>30.15</td>
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<tr>
<td>Report Number Index</td>
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<td>12</td>
<td>552</td>
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<tr>
<td>Master List/Author Report</td>
<td>129</td>
<td>4</td>
<td>516</td>
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<tr>
<td>Master List/Borrower Report</td>
<td>129</td>
<td>4</td>
<td>516</td>
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<tr>
<td>Reminder/Indefinite Loans</td>
<td>70</td>
<td>1</td>
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<tr>
<td>Lost Materials List</td>
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<tr>
<td>Storage</td>
<td>30</td>
<td>52</td>
<td><strong>1,560</strong></td>
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</table>

Total per year **5,613.80**
REFERENCES


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