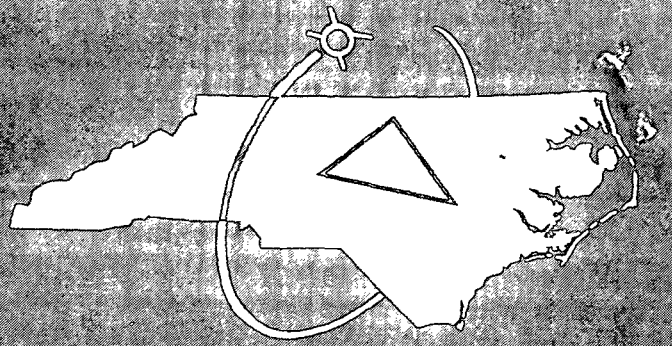




NORTH CAROLINA SCIENCE AND TECHNOLOGY RESEARCH CENTER

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FINAL REPORT
ON A
REGIONAL TECHNOLOGY TRANSFER PROGRAM

Contract NASW 2051

Period: November 1, 1970 - October 31, 1971

RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

FINAL REPORT ON A
REGIONAL TECHNOLOGY TRANSFER PROGRAM

NORTH CAROLINA SCIENCE AND TECHNOLOGY RESEARCH CENTER

P. J. Chenery, Director
Post Office Box 12235
Research Triangle Park, North Carolina 27709

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A B S T R A C T

NORTH CAROLINA SCIENCE AND TECHNOLOGY RESEARCH CENTER
RESEARCH TRIANGLE PARK, NORTH CAROLINA
FINAL REPORT ON A REGIONAL TECHNOLOGY TRANSFER PROGRAM
NOVEMBER 1, 1970 - OCTOBER 1, 1971
CONTRACT NASW-2051

This report details the continuing operation of a jointly state- and NASA-sponsored Regional Dissemination Center serving the southeastern United States. NC/STRC offers automated searching of large information collections, such as that assembled by NASA, with emphasis on textile-related files to serve regional industry.

During the contract period, NC/STRC conducted an in-depth analysis of its marketing programs and prepared a series of brochures aimed at various segments of industry. Heavy emphasis was also placed on the Library Search Service inaugurated by NC/STRC, and a total of 32 universities now participate in this service. Smaller schools are served through the university network.

Although the nationwide industrial recession caused a general drop in search requests, NC/STRC processed a total of 838 retrospective searches during this period: 39.97% for its industrial clients, 22.9% for university libraries, and 37.1% for other RDC's.

As previously reported, cleanly-documented cases of technology transfer have been difficult to uncover; however, NC/STRC presents four such cases which have been reported and documented by its clients.

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NORTH CAROLINA SCIENCE AND TECHNOLOGY RESEARCH CENTER

Final Report
on

A REGIONAL TECHNOLOGY TRANSFER PROGRAM

I. INTRODUCTION

This final report is submitted in fulfillment of the requirements of Contract No. NASW-2051, National Aeronautics and Space Administration (NASA), and describes the work performed under that contract for the period November 1, 1970, through October 31, 1971. An annual report for work accomplished under the same contract and covering the period September 1, 1969, through October 31, 1970, was filed previously.

Under the subject contract, the North Carolina Science and Technology Research Center (NC/STRC), operated a NASA-sponsored Regional Dissemination Center for the southeastern United States, serving industry and research organizations through a technology transfer program based on a computer-indexed "library" of technical and scientific reports emanating from the NASA program.

This report outlines the activities of NC/STRC during the contract period in the following sections:

- I. Introduction
- II. NC/STRC Organization and Background
- III. Services to Clients
- IV. Marketing
- V. Computer Activities
- VI. Meetings, Trips, and Visitors
- Appendix A - Cases of Technology Transfer
- Appendix B - Exhibits

II. NC/STRC ORGANIZATION AND BACKGROUND

NC/STRC is one of six NASA-sponsored Regional Dissemination Centers in the United States and the only one not housed within a major university. Whereas other RDC's are operated as a program of a School of Business Administration or Library Science, NC/STRC is a state agency with close ties to the Research Triangle Institute and all three Triangle universities - Duke in Durham, University of North Carolina at Chapel Hill, and North Carolina State University in Raleigh.

For the first seven years of its existence, NC/STRC was an independent agency of the state government of North Carolina. It was so designated in the legislative statute creating it (GS 143.41) in 1963 and it remained a separate entity until October 1, 1971. At that time, in accordance with the reorganization of state government plan enacted by the 1971 N. C. General Assembly, it became part of the Department of Natural and Economic Resources.

The reorganization plan, designed to reduce the number of state boards and agencies from over 300 to 25, should result in benefits to NC/STRC. Combining 23 separate agencies into one large department, Natural and Economic Resources is striving to reduce duplication of programs and facilities, strengthen smaller agencies through unified efforts, and eliminate much waste in overlapping duties and responsibilities.

Under the new set-up, budgeting, personnel, public relations, and physical services such as printing and duplicating are coordinated and unified. Although some areas of responsibility are still to be delineated, the first month of the merger has been successful.

Funding, physical facilities, and programs of NC/STRC remain unchanged. Under the current contract with NASA, expenses of operating the program (after deducting receipts from industrial clients) are shared jointly by NASA and the state of North Carolina.

A. Staff

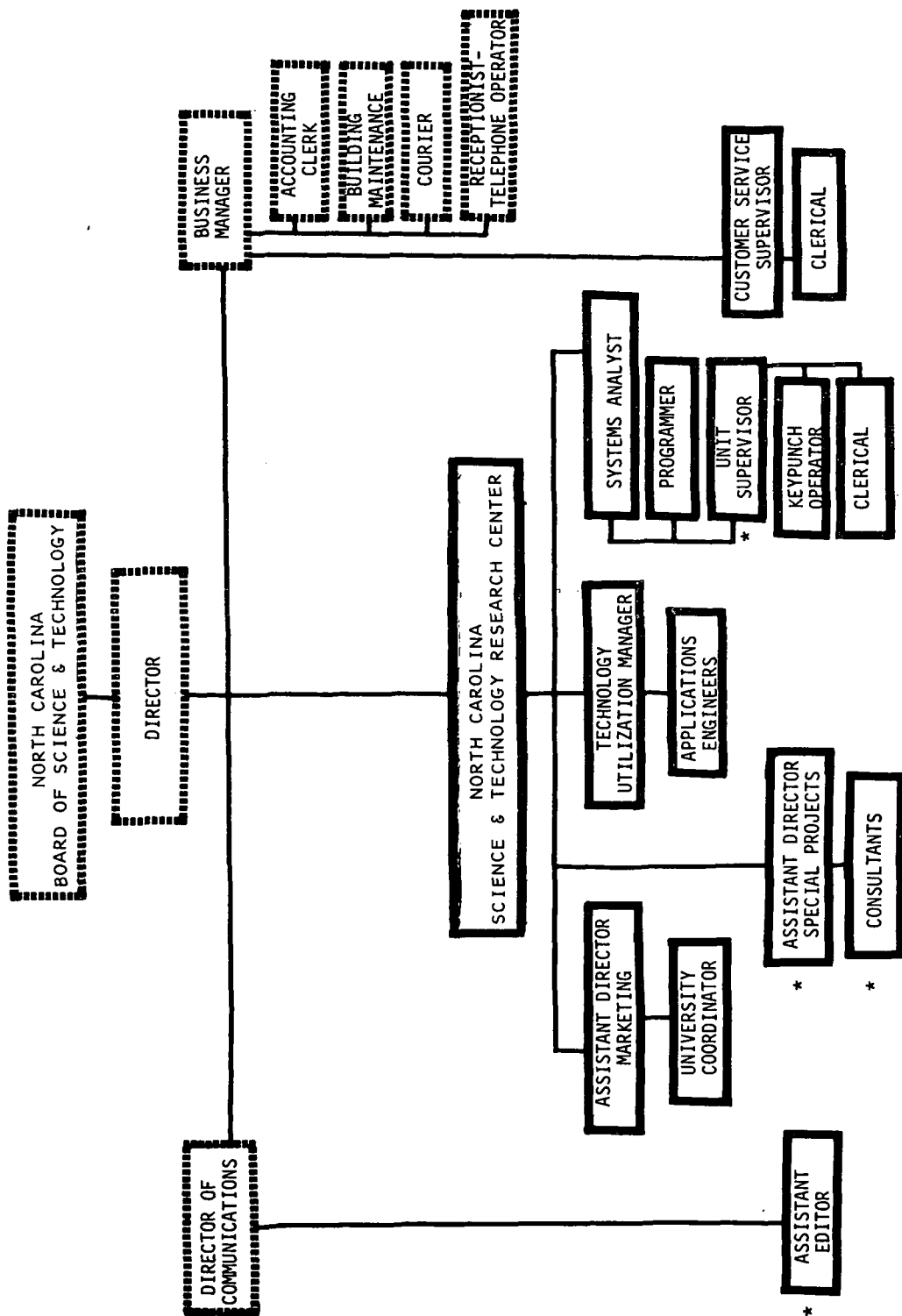
There have been several changes in areas of responsibility over the contract period: maintenance of records on customer accounts has been shifted from marketing to the business office; acquisition and implementation of data bases has increased in importance, resulting in more direct supervision of this section by the director; and supervision of clerical staff members, formerly under operations, is now under the control of the business office.

The number of permanent personnel on the NC/STRC staff has remained constant over the contract period. In addition to the regular staff, one applications engineer in the areas of biology and medicine was employed half-time; two temporary assistants joined the technical editor's staff; and several typists were employed on a temporary basis during vacation periods and to handle work overloads. Although there is some overlapping of areas of responsibility, staff positions as of October 31, 1971, are shown in Chart I, page 5.

In addition to these positions, two consultants have been employed to assist in special areas: Dr. Clement S. Logsdon, professor emeritus of marketing at the School of Business Administration, University of North Carolina, has served as marketing consultant to NC/STRC, and Dr. Larry Monteith, associate professor of electrical engineering, N. C. State University, was retained as a consultant on electronics engineering and to prepare a technical report on industrial noise pollution. A more detailed discussion of their work is included in Marketing (pages 27 and 28) and Service to Customers (page 19).

B. Facilities

In accordance with the statutes creating the agency, NC-STRC is housed in its own building in Research Triangle Park, adjacent to the Research Triangle Institute and near 21 other research facilities in the Park. These tenants, many of whom utilize NC/STRC services, include:



*Part-time or temporary positions.
Secretaries not shown.

Positions indicated with broken
lines serve both Board and Center.

FIGURE 1: NC/STRC ORGANIZATIONAL CHART

American Association of Textile Chemists and Colorists
Beaunit Fibers
Becton, Dickinson Research Center
Burroughs Wellcome Co.
Chemstrand Research Center, Inc.
Educational Testing Service
Hercules, Inc.
International Business Machines Corporation
National Center for Health Statistics
National Environmental Research Center
(Formerly Air Pollution Control Office)
National Institute of Environmental Health Sciences
National Laboratory for Higher Education
(Formerly Regional Education Laboratory for
the Carolinas and Virginia)
North Carolina Educational Computing Service
Research Triangle Foundation of North Carolina
Research Triangle Institute
Research Triangle Regional Planning Commission
Southern Testing and Research Laboratories, Inc.
Technitrol, Inc.
Triangle Service Center, Inc.
Triangle Universities Computation Center
U. S. Department of Agriculture - Forest Service

The Science and Technology Research Center building also houses the Triangle Universities Computation Center (TUCC), a non-profit corporation owned jointly by the three Triangle Universities which operates an IBM System 370, Model 165 time-sharing computer, the Research Triangle Park branch of the U. S. Postal Service, and the N. C. Educational Computing Service, a unit of the N. C. Board of Higher Education.

A proposed addition to the NC/STRC building to house more adequately the computing center was not funded by the 1971 N. C. General Assembly. Construction of this wing would have released several offices in the south wing of the building, presently occupied by TUCC, for use by NC/STRC. However, plans for the new wing have not been abandoned and NC/STRC hopes to increase its office space by 1,000 square feet within the next two years.

The branch Post Office, presently housed on the lower level of the Science and Technology building, will move in February 1972 to its permanent location in the Research Triangle Service Center,

about one-half mile southwest of NC/STRC. This move will release 1,135 square feet of floor space on the lower level.

C. Equipment

For the past two years, NC/STRC has leased an IBM Model IV Magnetic Tape Selectric Typewriter (MTST) to facilitate the typing, editing, and preparation of reports, form letters, and technical papers. During the current contract period, NC/STRC investigated the purchase of an Intel Word Processor utilizing paper tapes in lieu of magnetic. It was hoped that these would prove cheaper and solve the problem of tape storage and re-use.

Although the Intel was used at NC/STRC for several months, along with the MTST, it did not give satisfactory performance and was returned to the company. Problems with the Intel included torn tapes, difficulty in searching for a particular section, inability of the machine to reproduce exactly the same typed matter on successive attempts, and lack of proper training for the operator.

In addition to the MTST, electronic equipment at NC/STRC includes a Xerox 3600 electrostatic copying machine with collating capabilities up to 20 copies; a Recordak Model 1824 reader-printer for reproducing hard copy from microfiche; an Atlantic Model 609 microfolio machine for microfiche-to-microfiche reproduction; teletypewriter and teletype computer terminals for rapid communication between NC/STRC and clients with TWX facilities.

III. SERVICES TO CLIENTS

The basis of service to any client, NC/STRC engineers believe, is a sound understanding of the client's business, product, or service, and his problems. This is best achieved by a personal relationship between the NC/STRC applications engineer and the client.* Although a number of corporate technical librarians work with NC/STRC

*As used in this section of the report, the term "client" refers to the engineer, scientist, or technician working on a problem rather than a corporation or industry authorizing service.

engineers successfully, this seems to be the exception rather than the rule.

For one thing, problems to be searched often need to be crystalized into a coherent statement using specific terms. Many times the client does not have a clear mental picture of the *question* he is asking; rather, he has a concept of the *answer* he needs. In-depth conversations with the applications engineer assigned to this case help to clarify the client's thinking and to formulate a question or questions which will retrieve from the system information pertinent to this problem.

Behind these in-depth conversations may lie many weeks or months of establishing rapport between NC/STRC engineer and the client. Often the client is reluctant to disclose exactly what he is seeking for fear this will reveal company secrets. He also needs to be assured of the NC/STRC engineer's competency in both information retrieval and the particular engineering discipline or disciplines in which they are working. Sometimes establishment of this confidence in an engineer's integrity and expertise is a slow and arduous process.

To protect a client's proprietary interest in his research endeavors, NC/STRC has, from the beginning, assigned a code number to each subscribing company. This appears in lieu of the company's name on all documents and records pertaining to that company. Under no circumstances does NC/STRC reveal a company's identity without specific permission to do so. With this assurance, most clients feel free to discuss the actual area of concern.

Sometimes, however, a client will hedge and circle around a statement of the real problem, thereby nullifying any chance of extracting pertinent citations via a search. Unless this barrier is overcome, there is no point in continuing service to such a client.

Company librarians, even though highly skilled, often have difficulty in obtaining from the client a clear, precise statement of the problem, along with peripheral areas that could be useful. In several instances, NC/STRC searches were evaluated as "useless"

by the client, working through a librarian. Direct contact between client and engineer, once achieved, revealed that the actual question was something quite different. In transmission from client to librarian to NC/STRC engineer, the question had "lost something in the translation."

NC/STRC offers several services to its clients: retrospective information searches, current awareness profiles, Standard Interest Profiles, engineering assistance, referrals, conferences and workshops. In addition, two NC/STRC publications, plus items selected by applications engineers from their daily scanning of technical literature, are sent gratis to clients and prospective clients.

A. Retrospective Searches

A "retrospective search" is exactly what its name implies: a review of a given file from the date of its availability (or some selected later date) to the date of the search. For instance, a client may request a search of the NASA file from its inception in 1962 - or from any particular date since that time - through to the latest abstracts indexed in computer storage. A search will then cover all of the documents dealing with the subject being searched which are included in the NASA system; the bibliography will cite only those identified by the computer as pertinent on the basis of index terms and logic used by the engineer.

NC/STRC further defines search operations as:

Search question - a statement of the subject being researched.

Sample search questions would be

- "Xenon Recovery"
- "Cracking of Cable Insulation"
- "Prevention of Aluminum Corrosion by Use of Sodium Chromate and Silicates"

Search problem - posing the search question against one or more files, or against one or more sections of the same file. For example,

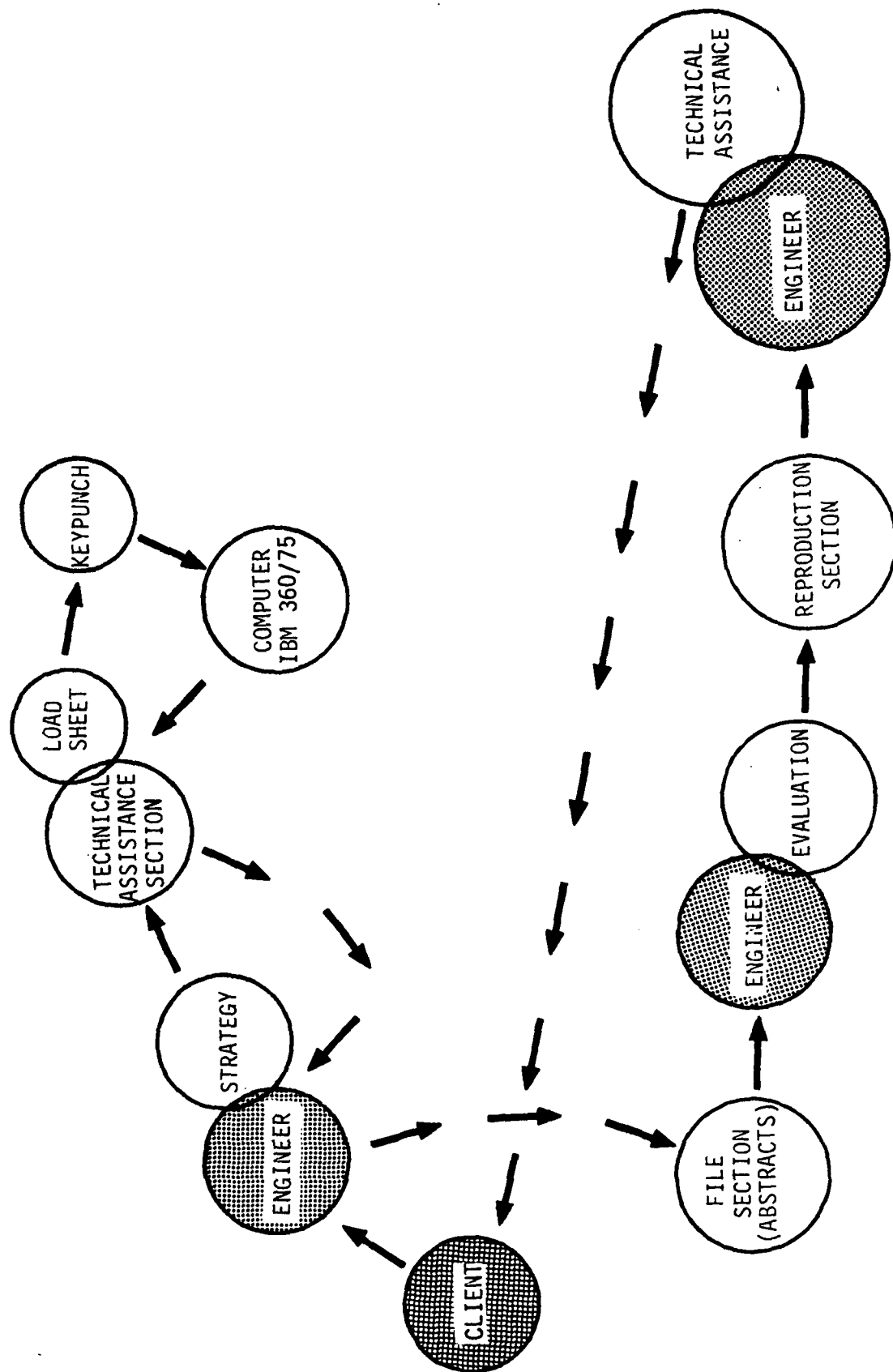
the search question "Radiation Processing of Textiles" was run against the two NASA files (SAL and Thesaurus), both sections of the DOD file, plus the Institute of Textile Technology file.

Let us take a typical search request and follow it through NC/STRC as it is processed.

Company XYZ requests a search on a particular subject. Normally, the request comes directly to the applications engineer who has previously been assigned to this company. Assignments are made on the basis of the company's general area of concern; i.e., electronics, man-made fibers, metallurgy, etc. The applications engineer whose training and background most closely match the company's field then becomes its NC/STRC representative. Recognizing that many problems overlap two or more engineering disciplines, NC/STRC engineers frequently consult with each other or with university faculty members to provide the broadest possible coverage for their clients.

As soon as the request has been received, a work order is issued by the customer service supervisor under the direction of the business manager. This work order follows the job through all the departments and no work is performed without it. When it has been issued, the engineer prepares the search strategy based on his knowledge of file content and company XYZ's needs. In the final analysis, the client determines much of the search strategy as it is he who decides whether the search should be broad and general, narrow and specific, cover one file only or all available and responsive files. The engineer recommends the scope of the search but it is the client who dictates how much is invested in the search.

The completed search strategy is forwarded to the technical assistance section where it is checked for misspellings, loadsheets are prepared, and cards keypunched. For several months, NC/STRC "batched" searches to cut computer costs, but new and additional



hardware at TUCC now makes it possible to run searches economically without batching. The resulting printout is reviewed by both the technical assistance section and the engineer for strategy success. If the search logic used was correctly selected, the number of citations retrieved will fall within predetermined limits. Below this limit, the strategy was too tight - too restrictive - and probably a number of relevant documents were not retrieved. Citations above this limit indicate that just the opposite was true and that much "garbage" has been retrieved along with the pertinent material. It is then the engineer's responsibility to redraft the search strategy to produce better results.

Once a satisfactory computer printout has been received, abstract cards usually are pulled for every accession number retrieved; however, occasionally the engineer will ask for only a certain group of cards. The engineer reviews each abstract manually and selects those which are pertinent to the original question or have peripheral interest. These cards are reproduced - three to a page - on the Xerox machine and bound into a bibliography, along with the search strategy and computer printout. This bibliography is mailed out to the client and the work order is closed. At every step in the process, the time involved is entered on the work order and initialled by the staff member performing that job. It is from these work orders that we obtain the statistics on the time required to process a search.

In recent months, detailed time records have been maintained on all phases of client service but especially in processing retrospective searches. This was originally set up for cost-accounting purposes but has also been useful in pointing up bottlenecks and weak areas.

During the three months these records have been kept, processing a search at NC/STRC has required an average time of 5.9 days. This includes all phases of processing from the time the work order * is

*Appendix B, Exhibit B-1

written until the completed job is delivered to the client. In a few instances, searches were processed within one day; however, this is the exception and not the rule. Very few required longer than the two-week service normally quoted.

Naturally, both the search itself and the engineer offer many variables in determining the length of time needed. Among these are:

- complexity of subject matter and search strategy;
- print-out format (accession numbers only or full bibliographic data);
- number of citations retrieved which must then be "pulled" on abstract cards and reviewed by the engineer;
- the engineer's individual work-pace as well as his workload;
- the urgency of the client's need.

This last item is usually predominant in those searches processed in one day. With the establishment of highest priority on a search, normal first-in, first-out policies are waived.

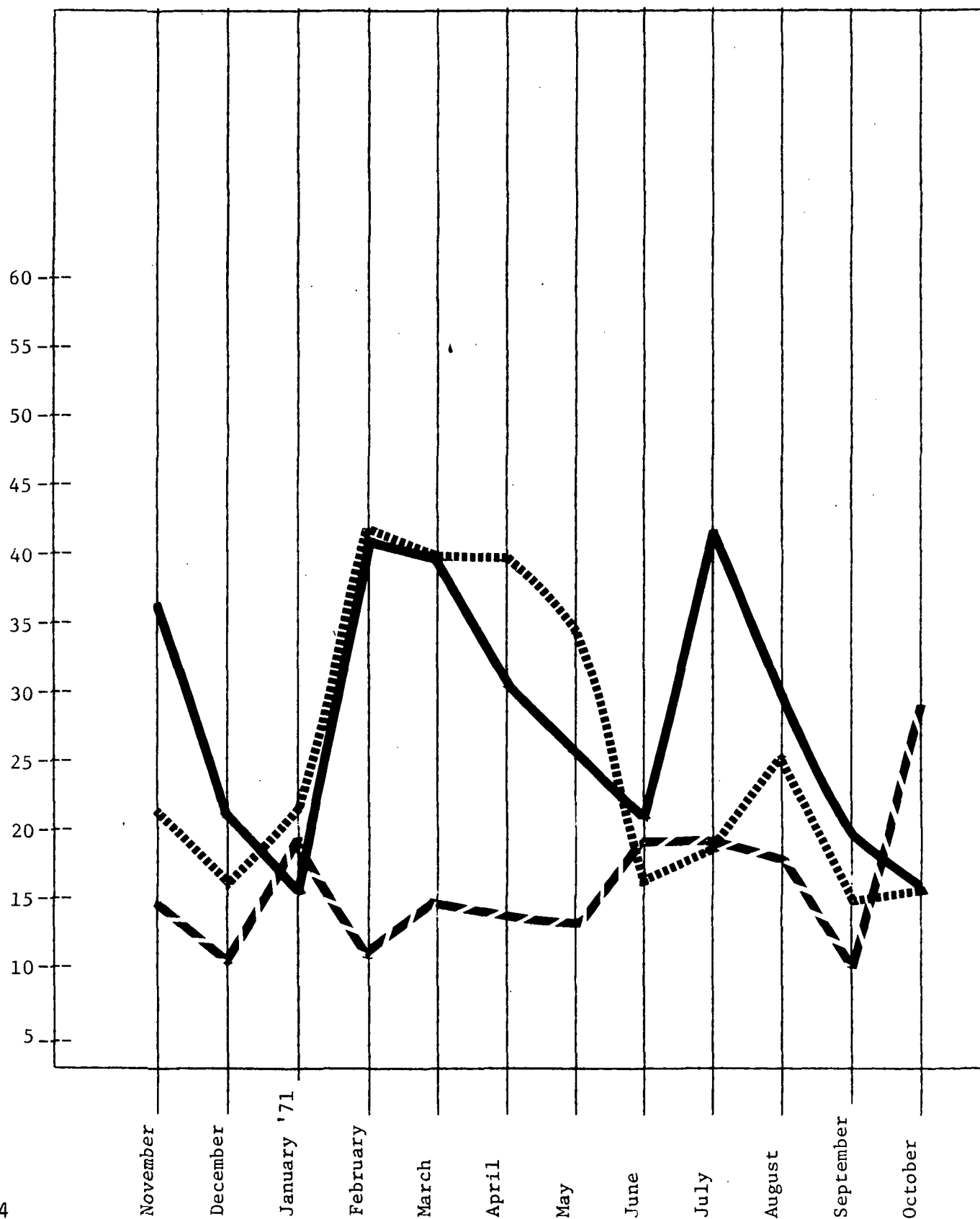
The marked drop in NC/STRC's level of customer service during the last quarter (see Graph, page 14) might be attributed to several factors, nearly all reflecting some aspect of the current economic recession:

- a heavy cut-back in federally supported research at universities;
- slackening of the Vietnamese involvement with resulting cut-backs in defense contracts;
- decreasing emphasis on the space program, which filters down even to small companies supplying basic materials to larger contractors.

One paradox evident is that many companies are being compelled to spend money on noise, air, and water-pollution abatement that might, conceivably, have been spent on research and development of new products. Whereas one might think that this situation would require more - not less - research and use of technological innovations, the developmental work is apparently being done mostly by the

■ NC/STRC Industrial Clients
 ▨ Library - University Clients
 Other RDC's

FIGURE 3
RETROSPECTIVE SEARCH ACTIVITY



suppliers of pollution-abating equipment, not by the companies concerned. Most efforts by NC/STRC engineers to work directly with the using companies have been fruitless; the full burden of meeting government requirements in this area is being placed on the consulting engineers hired by the various companies. For the most part, these suppliers are located in the heavily industrial North, not in the southeastern region served by NC/STRC.

The effects of the recession, most drastically apparent on the West Coast, have also had a decided effect on production in the Southeast.

Despite this, NC/STRC processed more than 800 retrospective searches during the twelve months of this contract. Of these, 39.9% were for NC/STRC industrial clients and 22.9% for universities served through the Library Search Service. The remainder (37.1%) were "wholesale" searches run for other Regional Dissemination Centers. See Table I following for a complete breakdown of figures by month.

The line graph on page 14 depicts the fluctuations in retrospective search requests over the period of this contract. The simultaneous drop in all three types of service requests (regular industrial clients, universities, and other RDC's) during December is easily tied into the Christmas holiday season. All RDC's, including NC/STRC, show a marked upswing in February and another decided drop in June - the beginning of the vacation period. The surprising note in this graph is the increased activity during the summer months on the part of the universities. We had expected that this service would become almost totally inactive between June and September; however, the Library Search Service volume has actually increased over this period, slackening off again in September prior to another upsurge in the late Fall.

The sharp increase in NC/STRC searches processed during July 1971 was due primarily to the Adult Learning Center at N. C. State University which ordered a number of searches and an unusual number of documents from them.

From the 335 searches processed for their industrial clients, NC/STRC engineers reviewed 148,426 citations and selected 49,977

abstracts as relevant. Unfortunately, it is impossible to make any sort of correlation between these figures for several reasons:

1. Four files (American Society of Metals, Engineering Index, Chemical Abstracts, and Biological Sciences) are not processed at NC/STRC. The 427 figure quoted above covers all searches processed for clients whether machine runs were made here or elsewhere.
2. Two file tapes (Educational Resources Information Center and Food Science and Technology Abstracts) produce full print-outs of abstracts which the engineers scan, but the number of relevant citations is not recorded.
3. No records are kept on the number of pertinent citations received on a BIOSIS search because it is not reproduced here.

Prior to the availability of additional files through other sources, records maintained at NC/STRC indicated that approximately one-third of all citations listed by the computer were considered relevant by the engineers. Presently, however, because of the complexity of search methods and resources, it is extremely difficult to confirm or revise the earlier percentage figures.

The NASA file was used for 38.6% of the retrospective searches and 10.6% of these searches included at least one other file. The most common companion for the NASA file was the Department of Defense file (later Government Reports Announcements), closely followed by the Institute of Textile Technology file.

Table I on the opposite page gives service statistics by months during the contract period.

B. Current Awareness Profiles

With the explosion in technology which we have experienced in the past few decades, it has become increasingly important for competitive firms to stay abreast of the latest developments in their field. By means of "current awareness" (CA) profiles, companies can do just this at little cost or effort to their staff. CA searches cover only that material which has been added to a file since the

	1st Contract Quarter 1970			1971			2nd Contract Quarter			3rd Contract Quarter			4th Contract Quarter			TOTALS
	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.				
RETROSPECTIVE SEARCHES																
REGULAR CLIENTS	37	22	15	42	38	30	25	21	42	28	19	16				335
LIBRARY SEARCH SERVICE	14	11	19	12	15	13	12	19	18	16	10	33				192
OTHER RDC'S	23	17	22	43	40	40	34	17	19	26	14	16				311
CURRENT AWARENESS																
NC/STRC	40	40	39	21	37	35	52	47	35	37	25	19				427
OTHER RDC'S	7	8	8	1	14	1	18	9	1	7	1	7				82
TOTAL HITS (NC/STRC ONLY)	11,728	8,980	10,492	16,448	14,096	12,431	7,857	13,810	16,708	16,531	9,440	11,896				148,426
ABSTRACTS (NC/STRC ONLY)	2,568	2,306	1,714	2,888	4,612	2,969	4,045	4,592	6,498	8,673	6,675	2,437				49,977
DOCUMENTS																
CATEGORIZED	115	234	133	131	130	100	72	108	81	135	86	75				1,400
TOTAL	191	337	208	229	240	161	191	263	263	352	235	263				2,933

TABLE I: SERVICE STATISTICS

last search was run - usually a month. However, some files are updated bi-weekly and others quarterly. Whatever the period, searches cover the most recent additions to a data bank and provide the latest information available.

Screening of these searches varies among clients. Some want the entire list of citations; other prefer hand-screening by the NC/STRC engineer. Because only a short period of time is covered, the number of documents retrieved is usually small and it is not uncommon for a search to retrieve zero citations if the subject matter is very restrictive.

A study of files searched on a current awareness basis at NC/STRC shows that use of the NASA file for CA profiles dropped from 20 search questions at the beginning of this contract period to 13 at the close. This is in keeping with the general trend in service noted elsewhere. Several companies combined two or more very narrow searches into one broader search; other companies simply curtailed expenses by terminating CA service.

The figures given in Table I, page 17 under CA profiles refer to those completed and delivered to clients during a given period. The fluctuation in number processed each month is due to several factors: late receipt of journals at NC/STRC, frequency of file up-dating, and dispatch with which the staff can reproduce abstracts and complete paperwork necessary to each search.

C. Standard Interest Profiles (SIP's)

SIP's are very similar to current awareness profiles, differing only in that the subject matter is chosen by someone other than the client who merely selects the SIP most closely suited to his needs. SIP's are much broader in scope than individually tailored current awareness searches and generally deal with a topic which of common interest to many companies. NC/STRC does not produce SIP's itself but serves its clients with SIP's which it obtains from other RDC's.

D. Special Studies

Although not producing SIP's as such, NC/STRC has published detailed and annotated bibliographies on several topics which it considered important to its clients. One of these, entitled "Air Pollution: Physiological Effects, Detection, and Control," was published in July 1971 and quickly sold out. It was reprinted in October and is still available. The bibliography deals with four air pollutants - carbon monoxide, sulfur dioxide, ozone, and oxides of nitrogen. It attempts to aid small industrial firms in the use of technical information available through NC/STRC in the measurement and control of these four pollutants.

A similar paper on noise measurement and control is currently being prepared.

E. Documents

The most logical end-product of a literature search is a particular document (or documents) which warrants study by virtue of the relevance of material in it. Unfortunately, there appears to be very little correlation between the searches processed at NC/STRC and the documents ordered through the Center during any given period.

As has been stated in previous reports, several factors influence the time between delivery of a search bibliography to a customer and the date he orders documents from it:

- length of bibliography
- number of client personnel who scan it
- client's document ordering system
- urgency of client's problem

In many cases, no documents are ordered through NC/STRC at all, although many may be especially pertinent, because the client can obtain them through his company library or a nearby university library quicker and more cheaply. The chief service of NC/STRC is identifying the document, rapidly and economically.

In the past year, NC/STRC has continued its policy of ordering documents largely from other sources rather than reproducing them in-house. This has proven cheaper, which benefits the client, and has freed NC/STRC personnel for other duties. Main sources of documents for NC/STRC have been the D. H. Hill and Textile libraries at N. C. State University, Aerospace Research Applications Center (ARAC) in Indiana, and the National Technical Information Service (NTIS) in Springfield, Virginia. Other sources include American Society of Metals, Linda Hall Library, U. S. Patent Office, foreign Patent Offices, and the National Research Library.

Many clients use the NC/STRC document ordering form shown as Exhibit B-2. When this is received, the librarian determines the best source for the document based on cost and delivery time. If more than one source is given and the client has not indicated urgency, the document is ordered from the least expensive.

Documents ordered by annual clients are mailed out as they arrive at NC/STRC, rather than being held until the order is complete. These clients are mailed a statement at the end of each month indicating the cost of documents ordered and the balance remaining in their account.

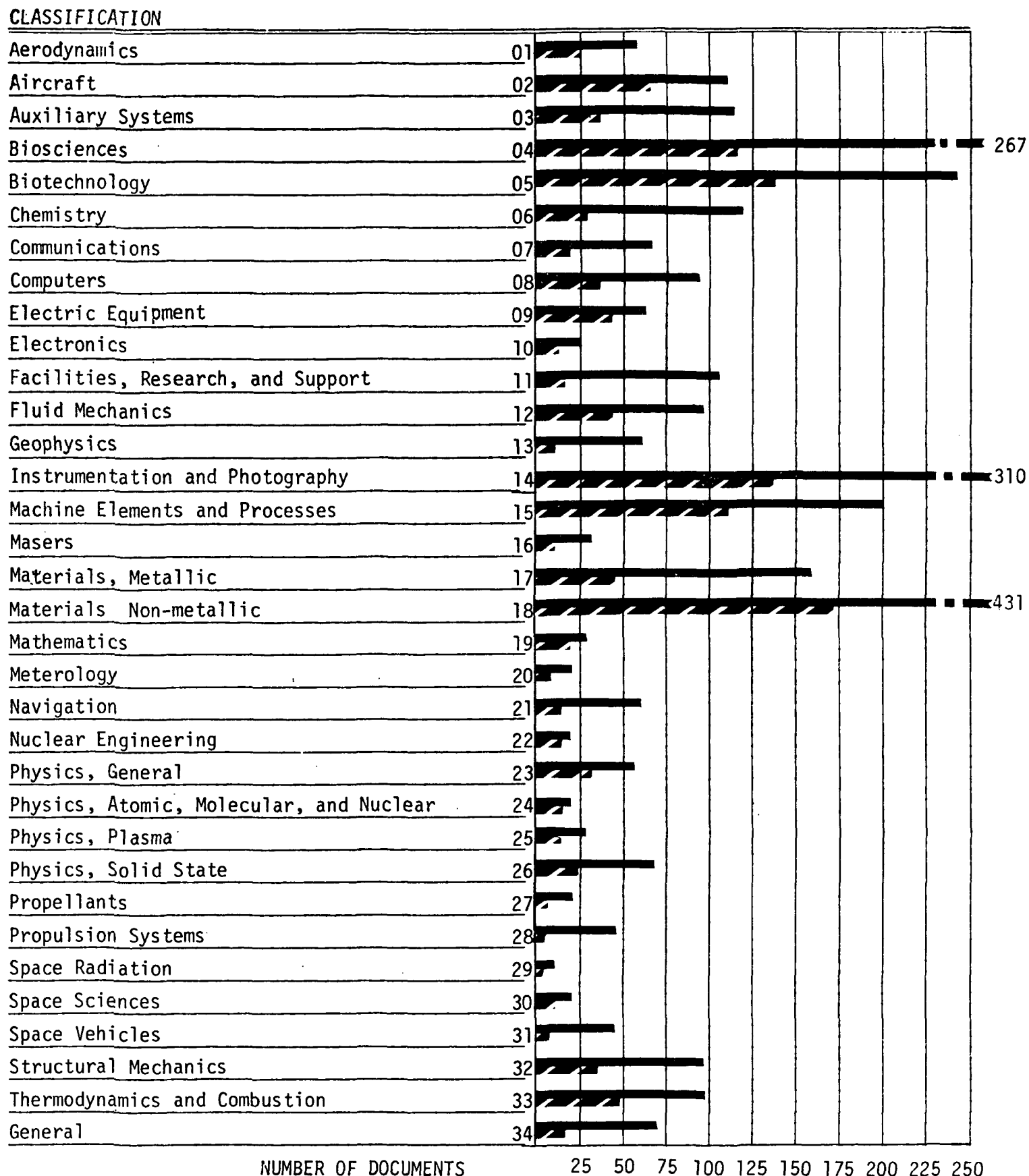
Documents ordered by demand clients are usually held until the order is filled and an invoice is enclosed.

All documents delivered to clients are logged out both in the company file and on a master list. This includes documents for which there is a charge, free documents requested by clients, and items of selective dissemination - reports, articles, and other written material which an applications engineer feels could be of interest and/or value to his client or a potential client.

Although a few documents have cost as high as \$15.40, the average cost to NC/STRC clients per document has been \$3.50 which includes postage and handling. The largest single order of documents was from the Adult Education Center at N. C. State University - 152 documents for a total cost of over \$200.

Documents which can be classified under STAR categories are shown in the bar graph on page 21.

Figure 4:
CLASSIFICATION OF DOCUMENTS DISSEMINATED
BY STAR CATEGORIES



1327 Documents Disseminated from November 1, 1970 - October 31, 1971

— 12 months ending October 1970
 ▨ 12 months ending October 1971

F. Library Search Service

Since the beginning of the contract period, the Library Search Service (LSS) has begun to fulfill many of the goals envisioned at its inception. Probably one of its most important contributions has been to establish a name for NC/STRC within the traditional library community through participation in professional library associations, talks to library science classes, and promotion of the library as a focal point for the gamut of information services. The participating library search writers have come to consider themselves extension agents for NC/STRC activities, primarily because of the frequent communication between them and the coordinator of university relations, keeping them up-to-date on all NC/STRC services and discussing problems of mutual interest.

Through education of the librarians in new techniques and concepts of librarianship, NC/STRC has witnessed changing attitudes on the part of the participating librarians. A large part of this education has been in demonstrating the need for publicizing library services. The advertising materials, such as posters and brochures provided by NC/STRC, have been successful; this success has shown the librarians that publicity might encourage use of other library services as well. In addition, the orientation for librarians in the program includes in-depth explanation of the coverage of the files available for searching. Along with this has been an emphasis on the librarian's role as a resource person - not necessarily as one who knows all the technical details of a research problem, but as one who knows where to direct researchers to find the information they need. The idea is to promote creative research techniques by suggesting resources that library patrons might not have considered.

Perhaps these changed attitudes have resulted from a general trend to modernization of library functions, which has necessitated librarians' acquisition of new knowledge and skills, but the fact remains that NC/STRC's efforts have made a distinct impression.

The LSS has proved to be a continuing educational experience for the librarians involved. Initially, the simplest search writing

techniques are presented, since most librarians have had little direct contact with computerized retrieval. As they receive search requests, questions arise concerning more complicated search strategy. Librarians are encouraged to contact NC/STRC's coordinator of university relations to discuss these questions. In addition, each library search is reviewed by the coordinator as it is received and improvements in strategy are made when necessary. Whenever this occurs, the librarian is informed of the changes with an explanation of why the changes were considered desirable. Search results are funneled through the librarian so that he can see how successful his strategy is in meeting the student's needs. This approach also enhances the library's role as an information center, since all contact occurs between the librarian and the student. A decided improvement in search writing technique has been observed in those librarians who submit a fairly large number of requests.

Thirteen more universities have joined the LSS network during the contract period, bringing the total to 32. New members are:

- Appalachian State University
- Emory University
- Florida Agricultural & Mechanical University
- Florida State University
- Louisiana Tech University
- Memphis State University
- Mississippi State University
- University of Miami
- University of Mississippi
- University of North Carolina, Chapel Hill (three libraries)
- University of North Carolina, Greensboro
- Virginia Commonwealth University (two libraries)
- Virginia State College

A concerted effort has been made to offer the LSS only to those universities that have fairly large graduate programs in the disciplines which can be well served by the four files offered under the LSS: NASA, ITT, GRA, and ERIC. The list of participating schools

is now virtually closed, but other approaches are planned for these and additional schools in the Southeast. These plans are discussed under University Marketing.

Although the level of usage by students is satisfactory (an average of sixteen requests per month), much work still needs to be done to promote the LSS. The 192 searches for the contract period came from 27 of the 32 schools, leaving five that submitted none during the year. The reasons for this rest primarily on the attitude of the library search analyst toward promoting the service, although access to other, cheaper sources for searches has reduced the usage in some schools. The largest user has been the University of Florida with 55 searches for the contract period. There are two apparent reasons for this:

1. The University of Florida has a multitude of graduate programs for which NC/STRC can provide fruitful searches.
2. The library search writer makes constant attempts to keep faculty and students aware of the LSS. Each quarter he sends out a memorandum to appropriate departments about this program.

The University of Florida was enrolled in the LSS in December 1969 but search requests did not really begin to come in until late 1970. This indicates that other schools which have started slowly might be cultivated to the same extent as Florida, ultimately becoming good users.

An unexpected aspect of LSS usage has been the constancy of search requests throughout the year. It might be expected that the summer would be a slack time; however, this has not been the case. The only two months in which there has been a noticeable drop in student requests have been May and September, corresponding to the beginning and end of the academic year.

Those schools with little or no usage have not been dropped from the program. The most expensive single item in carrying an LSS school is the initial cost of librarian orientation and postings dictionaries for the files. The cost of maintaining a school is

minimal, since most contacts are made by letter and phone. In addition, the fact that NC/STRC has an agent on campus gives us certain advantages in keeping our name before the staff and faculty, and facilitating the organization of presentations, etc., whenever a visit is desired. The purpose of the LSS, after all, is ultimately to market full-priced services, and the library contact can be instrumental in securing regular clients. The librarian at West Virginia University, for example, has written only one student search, but he has sent us a demand client and has generated a great deal of interest among faculty members in our regular services.

After the initial visit to a university to establish the LSS, subsequent visits have used the library contact as an organizer of faculty meetings to explain NC/STRC's regular services. Many librarians have attempted to persuade university administrators to subscribe to our services on an annual basis. The following demand clients have been added by referral from library search analysts during the year:

- Booker Bay Haven School, Sarasota, Florida
- Research Administration Center, Memphis State University
- School of Education, University of North Carolina, Chapel Hill
- College of Education, West Virginia University
- University of Florida
 - Department of Civil Engineering
 - College of Education
 - Institute of Development of Human Resources
 - Department of Music

One of the major reasons for the transition from the Graduate Search Program (GSP) to the LSS was to continue to provide low-cost searches to students but cut expenses of the program. The data below indicate that this has been accomplished already, to some degree.

LSS PROGRAM: INCOME vs. COSTS

	1967	1968	1969	1970	1971
Income by year	\$162.00	\$1183.00	\$3500.00	\$3507.00	\$3558.00
Travel by year	\$459.00	\$1480.00	\$2059.00	\$1507.00	\$ 558.00
Average cost/search	\$ 75.00*	\$ 75.00*	\$ 28.10	\$ 24.05	\$ 29.32
Average price/search	\$ 5.00	\$ 10.00	\$ 15.00	\$ 15.00	\$ 16.64
Average subsidy/search	\$ 70.00	\$ 65.00	\$ 13.10	\$ 9.05	\$ 12.68

Income has remained fairly constant for the last three years, but the decrease in travel costs is significant. Since 1969, travel expenses for the program have steadily decreased, especially in the last year. This is a result of having NC/STRC agents on the campuses to market our services, thus eliminating much travel needed to obtain business. The average cost per search does not appear, on the surface, to have decreased, but when increased labor and computer costs are considered, the fact that subsidies have remained fairly constant over the last few years is noteworthy.

Another area in which we feel long-range costs will be cut is in publicity. In September 1971, mass-produced displays were sent to all library search analysts. The cost of producing these posters was significantly less than those prepared the previous year. Also, the smaller size of the posters cut shipping costs. It is intended that these posters be kept by the libraries indefinitely, thus eliminating the need for new posters each year. The brochures have continued to yield results. (Appendix B, Exhibit B-3)

IV. MARKETING

In point of time, marketing comes before service to clients but the two are in fact so intertwined that it is often difficult to delineate one from the other. A "technical" visit, to discuss a proposed search, easily becomes a "marketing" visit if more searches are ordered than originally planned. Sometimes a marketing visit ends up as a technical visit and the applications engineer serves in a dual capacity.

*During 1967 and 1968, all student searches were prepared by NC/STRC engineers on the NASA file only. Since exact cost figures are not available for those years, the price charged regular clients has been used, since user charges represent direct costs of services rendered.

A. Development of New Markets

For the first part of this section, however, we will be dealing primarily with the identification of, and solicitation of business from, companies not previously served by NC/STRC. In other words, the development of new markets. In order to accomplish this, marketing efforts were made in a number of directions:

- an in-depth marketing study
- publication of a monthly bulletin
- expansion of the Library Search Service in universities
- creation of new printed marketing materials
- compilation of a mailing list of libraries in research facilities.

All of these are discussed in detail in the following sections.

1. Marketing Study

Dr. Clement S. Logsdon, professor emeritus of marketing at the University of North Carolina, was retained late in 1970 to serve as a consultant on the marketing program. All previous marketing efforts were reviewed and evaluated and a detailed analysis made of the market potential in the area served by NC/STRC. This analysis was based on several factors: type of industry, company size, relationship to parent organization, attitude of management (progressive, archaic, or predatory), and general economic condition.

Based on the agency's resources in personnel and funding, the following decisions were made regarding marketing materials and publications:

- a. The quarterly newsletter TECH TOPICS would be retained in its present format and frequency of publication.
- b. A series of marketing brochures would be devised, each slanted at a specific market in lieu of the one larger, more generalized, brochure used earlier.
- c. In an effort to keep NC/STRC constantly before its publics, a monthly publication would be inaugurated which would be short, factual and highly technical in its subject matter as opposed to the much broader scope of

TECH TOPICS. An editorial committee consisting of the assistant director for marketing, the Technology Utilization manager, and the technical editor was made responsible for its format, contents, editing, printing, and distribution. (See Section B. following)

Dr. Logsdon also worked with the marketing staff on development of a systematized approach to prospecting and selling; i.e., identifying prospective users; contacting the decision-making element within the company; and maintaining contact over an extended period of time.

During the summer months a graduate student in business administration (with a bachelor's degree in engineering) helped with the analysis and evaluation.

2. Technical Bulletin

The TECHNICAL BULLETIN, an outcome of the marketing study, was introduced into the program during the second half of the contract period. The first mailing, limited to 500 carefully selected individuals, was sent out in May 1971. It consisted of a single sheet printed front and back, with the NC/STRC logogram used as a masthead. The first three issues were enclosed in letterhead envelopes and mailed at first class postage rates. A letter of introduction from P. J. Chenery, director, accompanied each Bulletin, as well as a business reply card for ease in ordering items listed.* The Editor is J. Graves Vann, Jr., Technology Utilization Manager.

Content of the Bulletin has been limited to very brief, informal items about publications (articles, governmental rulings and regulations, conference proceedings, manuals) which NC/STRC engineers feel are timely and important. It is geared to the busy executive who has at most a few seconds or a minute to devote to each item of mail on his desk. Catchy indexes along the margins and standard 3-hole punching encourage him to file the Bulletin in a loose-leaf notebook for future reference.

The response of industry to the first three issues was extremely gratifying. From the 1,857 total mailings, we received 138

*Exhibits B-4 through B-6

replies - a 7% return. Table II below gives a breakdown of returns from each of the three mailings. A study of the reply cards showed that:

- 102 industries in 15 states were represented
- 42 of the industries were not then clients of NC/STRC
- 127 individuals requested documents from the Bulletin, indicating the desirability of spreading future mailings across company personnel.

TABLE II

TECHNICAL BULLETIN REPLIES			
	<u>Issues 1-3</u>	<u>Issues 4-6</u>	<u>Totals</u>
Mailings	1857	2341	4198
Cards Returned	138	145	283
% Return	7%	6.2%	6.8%
Individuals Requesting Items	127	122	188
Items Requested	271	243	514
No. Industries Replying	102	100	159
Income from Documents	\$259.40	\$389.45	\$648.85

In July, the mailing list was increased to approximately 1,200 per issue, and special envelopes were printed with a bulk mailing permit for third class postal rates. Although the response to the TECHNICAL BULLETIN indicated that it would be well received in many companies, it was decided to restrict additional names to those of small companies within North Carolina, at least for the present time. The reasons for this decision were:

- a. Small businesses need assistance more than large firms but have less access to technical information.
- b. Technical and managerial personnel in small firms often move to larger firms where a need for NC/STRC search capabilities can be exploited.
- c. Small firms can and do grow, becoming more likely to use full NC/STRC services.

The documents consist of purchasable and free items. The most popular subject category of the six-month period was "Production Technology" in which 87 documents were ordered constituting 17% of the total documents ordered.

The breakdown on categories of documents ordered is given below.

TABLE III

DOCUMENTS ORDERED FROM TECHNICAL BULLETIN			
<u>CATEGORY</u>	<i>Number of Copies</i>		
	<u>ISSUES 1-3</u>	<u>ISSUES 4-6</u>	<u>TOTAL</u>
Joining & Fastening	30	0	30
Materials	50	33	83
Management	26	18	44
Pollution	46	35	81
Textiles	12	3	15
Safety	14	37	51
Reclamation & Salvage	19	0	19
Production Technology	35	52	87
Protective Coatings & Lubricants	11	3	14
Analysis & Testing	28	31	59
Machinery & Equipment	0	30	30
Others	0	1	1

Based on the total of 514 documents requested and the comments included with orders, the staff feels that this is one of the best marketing tools devised so far for keeping the identity and services of NC/STRC constantly before those we hope to reach.

3. University Marketing

Because of the success of the LSS, NC/STRC has adopted a new philosophy in approaching the university community. Formerly, university library directors were bypassed in initial campus contacts; directors of research and graduate school deans were considered the prime targets for NC/STRC marketing. Most of these administrators,

however, are far removed from the details of on-going research for their campuses. The academic chain of command is extremely relaxed, and administrators may not be aware of the specific information needs of their researchers. A good library director, on the other hand, is constantly looking for new ways to serve his patrons. Information service is his business. He is especially interested in services that are economical. Therefore, during this contract period, a number of steps have been taken to involve libraries in the marketing of NC/STRC's regular services, while still following leads on individual professors.

It is felt that the universities with the best potential for NC/STRC services are already in the LSS. There are many colleges and universities that have more limited potential but still need to be explored; however, it is not economically feasible to visit all these institutions without some indication of their need for NC/STRC services. In an effort to reach these smaller colleges and universities in the Southeast, a questionnaire was sent to 181 library directors in 13 states, along with a cover letter and descriptive literature on NC/STRC capabilities. (Exhibits B-7 and B-8) Responses totalled 41%; Table IV below indicates returns by state.

TABLE IV

LSS QUESTIONNAIRE RESPONSE BY STATE			
<u>STATE</u>	<u>NO. SENT</u>	<u>NO. RETURNED</u>	<u>PERCENT RETURN</u>
Alabama	16	5	31
Arkansas	13	1	7
District of Columbia	7	1	14
Florida	13	8	62
Georgia	11	6	54
Louisiana	15	5	33
Mississippi	13	5	38
North Carolina	25	13	52
Oklahoma	18	7	38
South Carolina	8	3	37
Tennessee	8	4	50
Virginia	20	10	50
West Virginia	<u>14</u>	<u>7</u>	<u>50</u>
	181	75	41 (Average)

A comparison between enrollment figures for schools receiving questionnaires and the thirty-two LSS schools shows the new market reached (Table V).

TABLE V

Enrollment Figures: Schools Receiving Questionnaire vs. LSS Schools			
<u>Enrollment</u>	<u>Schools Returning Questionnaire</u>	<u>Schools Not Returning Questionnaire</u>	<u>LSS Schools</u>
Not given	3 (4%)	8 (8%)	0
100-1000	23 (31%)	35 (32%)	0
1000-2000	19 (25%)	27 (25%)	0
2000-3000	14 (19%)	10 (9%)	1 (3%)
3000-4000	6 (8%)	8 (8%)	3 (9%)
4000-5000	3 (4%)	4 (4%)	0
5000-6000	2 (3%)	2 (2%)	2 (6%)
6000-7000	1 (1%)	4 (4%)	4 (13%)
Over 7000	4 (5%)	8 (8%)	22 (69%)
	75	106	32

A further indication of the types of schools that had not been contacted previously is an analysis of the mailing list by highest degree offered versus highest degree offerings in the LSS schools (Table VI).

TABLE VI

Highest Degree Offerings: Schools Receiving Questionnaire vs. LSS Schools			
<u>Highest Offering</u>	<u>Schools Returning Questionnaire</u>	<u>Schools Not Ret. Questionnaire</u>	<u>LSS Schools</u>
2 but less than 4 years	3 (4%)	9 (8%)	0
4 or 5 yr. baccalaureate	34 (45%)	50 (47%)	0
1st professional level	4 (5%)	2 (2%)	1 (3%)
Master's Degree	18 (24%)	25 (23%)	4 (13%)
Beyond Master's but less than Doctorate	3 (4%)	6 (6%)	3 (9%)
Doctorate	13 (18%)	7 (7%)	24 (7%)
Unknown	0	7 (7%)	0
	75	106	32

An analysis of the responses showed that 76% of the libraries provide assistance to faculty and students performing literature reviews. Of these libraries, 37% do not have adequate resources for satisfying information requests. The 24% who replied that they are not called on to assist with literature reviews indicates that perhaps a sizeable number of professors do not use their libraries to obtain the information they need. In these instances, the library directors cannot be considered the best targets for NC/STRC marketing. For this reason, marketing to both library directors and individual faculty is necessary.

It is alarming that only 22% of the librarians indicated that they employ external searching services. Perhaps the situation exists because they are not informed of the existence of such services. This is an area which needs attention. The small colleges which have little on-going research may not need external searching services frequently, but when they do, the librarians need to know where to go.

The fact that 81% of the libraries do not have, nor are they contemplating, the establishment of internal computerized information retrieval indicates that the monumental cost involved, primarily for competent manpower, makes the establishment and maintenance of such a system prohibitive for most libraries. This situation has prompted much of NC/STRC's efforts with university libraries in the recent past and the questionnaire responses indicate that more emphasis needs to be placed on this area in the future.

Of the libraries replying that greater access to current literature would be helpful (65%), only five indicated that their reference questions fell outside the scope of research areas covered by the NC/STRC resources. Three of the responding librarians requested further information on the Center. One of these, Virginia Commonwealth University Libraries, later took a \$1,000 annual subscription and joined the LSS network.

In an effort to discover first-hand the potential of some of the libraries in the mailing list, visits were made to schools in the area of LSS schools to which visits were already scheduled. In the future,

it is planned that the same procedure be followed, since it does not seem worthwhile to plan a trip totally devoted to low-potential schools. The following schools from the questionnaire mailing list were visited during the contract period:

Norfolk State College
West Virginia Institute of Technology
Kanawha Graduate Center, West Virginia University
Glenville State College
West Virginia Wesleyan College

In all cases, the response was excellent. The library directors arranged meetings for the NC/STRC representative with both library staff and faculty. Although frequent usage of NC/STRC services is not anticipated from these schools, those present at the briefings promised occasional requests for service. These visits indicated that a mass-produced display for use in non-LSS libraries might be useful as an inexpensive marketing tool.

During the next contract period, efforts will be made to get subscriptions from university libraries on a long-term, full-paying basis. Studies will be made to determine whether or not an actual dollar savings can be realized by the libraries if they put the proposed salary of one reference librarian into NC/STRC for information services, rather than hiring a new librarian. Favorable results from these studies may enable NC/STRC to strengthen its position within the university library community.

4. Marketing Literature

During its existence NC/STRC has usually confined its major marketing effort to a single piece of literature. This program began with a large, multi-page brochure listing the advantages of adopting advanced technology for manufacturing operations, some of the contributions of the space program to advanced technology, how a computerized information retrieval system works, NC/STRC services and prices, and pictures and backgrounds of NC/STRC professional staff. This brochure served for several years and was reprinted once in different colors.

Frequent personnel, price, and file availability changes, however, made it impractical to continue this type of program. The brochure was expensive and there were instances where a great many companies were to be contacted by mail. As a result, it became the practice to substitute a marketing letter for the brochure in many cases. In other cases, a shorter letter accompanied the brochure.

This experience led to the production of a two-color-plus-black-on-grey-stock, single sheet flyer which folded to fit a standard business envelope. This flyer was superseded about a year later with a similar format flyer of different content and artwork. These flyers were used extensively in direct mail advertising, usually supplemented by a marketing letter. Price and supplementary information on specific files were inserted in the mailings.

Various members of the staff were unhappy with this type of activity. As might be expected, the reasons varied with staff member's background and responsibility. The complaints included:

1. The literature was too "busy," too full of too much information to command the attention and understanding of harried business executives.
2. The space available was too small to tell our story adequately, to explain what computerized information retrieval is and what it can do for a company.
3. The copy and artwork were too bland.
4. There was no "hard sell."
5. There was no chance of conducting a continuing marketing campaign with only one piece of literature.
6. First class postage for the contemplated volume was very expensive.
7. Production of the large number of marketing letters desired was expensive, even with semi-automated preparation.
8. It was difficult to fit the needs of all customers with a single piece of literature.

As a result of these complaints and a shortage of existing flyers, an extensive, summer-long study and literature development program was

carried out by Dr. F. O. Smetana and Mr. John Bartelme, a summer intern. Mr. Bartelme, a graduate industrial engineer with military experience in logistics, is currently a graduate student in business administration at UNC-Chapel Hill. He had just completed several courses in marketing during the spring semester. Included in the NC/STRC study were the printing budget and the limitations imposed by the State on printing activities. The study concluded that:

1. We should attempt to segment the market. We should design separate literature for sophisticated (research-minded) prospects who need to know the advantages which accrue from computerizing information retrieval and something on how it's done. This piece should have a pocket or location for attaching matching price lists and fact sheets on the appropriate files for particular prospects.
2. We should design a series of pieces directed toward the unsophisticated prospect. These should be short, eye-catching, without any detail on how the system works. (It wouldn't be understood anyway.) They should provide for some specialization according to industry so that one or more pieces within the series would be appropriate to a particular company. These could also be used in a continuing campaign.
3. This series should emphasize the economic advantages of introducing high technology into more applications.
4. The artwork should be slyly humorous and a little subtle.
5. For cost and policy reasons we would have to stay with one or two colors plus black on colored stock.
6. Color should be used boldly to attract attention.
7. Copy should be as short and punchy as possible, with large, eye-catching type.
8. Copy should be so designed as to eliminate the need for cover letters or accompanying marketing letters.

9. At least some of the pieces should be designed to eliminate the need for envelopes.
10. We should be able to send the prospect the sophisticated piece without extensive repetition of ideas if his understanding of NC/STRC's activities improves after receipt of the unsophisticated series.

Copy and initial drafts for the art work were prepared for seven distinctive pieces: an eight-page item for sophisticated prospects and six, four-page items for unsophisticated prospects. The individual thrusts of these six pieces were:

1. What's the value of scientific information?
2. What are the benefits of the space program?
3. Are you suffering from a technology gap?
4. Use the right tool for the job. (application to process industries)
5. Use the right tool for the job. (application to furniture and textiles)
6. Let us help you get the information you need for pollution control.

For reasons of cost, numbers 2, 4, and 6 were later eliminated.

The copy and art were circulated among the staff for criticism and appropriate revisions made. The art work was then submitted to professional graphics designers who attempted to retain at least the concepts in the final designs. Again for reasons of cost, the pieces were executed at the N. C. State University Print Shop. The priority which could be obtained, however, was not very high. Thus, final delivery of all the pieces is not expected before the mid-point of the next contract year. Comment on the completed pieces and the mock-ups of the others by personnel from the other RDC's and professional advertising people has been very favorable.

For the immediate future, direct mail marketing will be conducted much in the manner that it was in the past using the pieces available. When the entire series is finally available, the change to the new

advertising concept can be carried out. Copies of the series will be forwarded to NASA at that time.

It is planned to evaluate recipient response to the new literature over a period of about one year before determining whether to reprint these pieces or to develop new ones of a different approach.

5. Industrial Research Laboratory Directory

During the third and fourth quarters, a major marketing endeavor was the compilation of a mailing list of librarians and technical information specialists in industrial and research (non-academic) organizations. Recognizing that the library is an excellent entree to university faculty and students, it was felt that company libraries might provide the same entree to personnel in industrial firms.

A search for libraries in the INDUSTRIAL RESEARCH LABORATORY DIRECTORY revealed 101 companies not previously contacted by NC/STRC, and supplemental information on 99 others. The information in the directory was correlated by the marketing staff so that firms listing interests which are well treated in NC/STRC files were contacted by a special mailing of new NC/STRC literature. These firms are now included in our regular mailing lists. These laboratories are believed to represent some of the most likely users of NC/STRC's services.

6. Small Business

One other marketing area to be explored during this contract period is that of the very small businesses in North Carolina.

The supervisory Development Training (SDT) division of the N. C. Department of Community Colleges has tried reaching out to the small businesses in the State in an effort to expand its program. SDT has sent out questionnaires designed to determine problems and needs of some 4,000 small companies. These industrial needs are then matched up with the SDT services, one of which is referrals. If a company's reply indicates a need for technical information services, that company will then be directed to NC/STRC.

Several meetings with SDT staff members have been informative and helpful to the NC/STRC staff. SDT members are keeping us advised as to questionnaire results and working with us in providing services to those companies having a potential need for NC/STRC services.

B. NC/STRC Clients

1. Reassessment of Client Files

During the contract period a reassessment of client files and records was part of a major marketing staff undertaking to streamline the work-order system. The reassessment involved:

- retirement of files on inactive companies;
- new definitions of the terms "annual subscriber" and "demand user" for record-keeping purposes;
- merging of the individual graduate student search statistics with the Library Search Service statistics.

The revised definitions state:

- A client who has a drawing account of no less than \$500 or one who has a current awareness profile subscription for no less than 12 months is classified as an annual subscriber.
- A demand user is one who has less than \$500 in a drawing account or one operating on a pay-as-you-go basis and requesting service during the quarter period.

Any university library participating in the Library Search Service is referred to as a University Client. Non-student academic clients are dealt with as individual clients, not as University Clients.

Changes made in the NC/STRC price schedule for clients included:

- elimination of reduced prices for multifile-searching;
- elimination of a double price structure, one for demand clients and one for annual clients;
- authorization of a 15% credit for clients establishing and utilizing a drawing account of \$500 or more.

The new schedule has been favorably received by prospective clients and seemingly has encouraged more frequent usage of the Center's services.

2. Subscriptions and Attrition

Although the total number of annual subscribers declined - due partly to retirement of inactive files and partly to the national economic situation - the number of demand users increased 13% over

the previous contract period. Despite their irregular use of NC/STRC services, demand clients are becoming increasingly important in terms of their *collective* dollar value, as well as the very distinct possibility of converting them into annual subscribers.

The number of educational institutions using NC/STRC services also increased from 11 to 20; all are demand users.

Tables VII through IX on the following pages attempt to analyze NC/STRC clientele in several ways: type of organization, size (in terms of total number of employees), and SIC code of manufacturing clients.

TABLE VII

NC/STRC CLIENTS SERVED DURING CONTRACT PERIOD		
Type of Organization/ NC/STRC Relationship	Period Ending October 31, 1970	Period Ending October 31, 1971
<i>Annual Subscribers</i>	47	47
Manufacturing Firms	41	38
Research Organizations	6	8
Educational Institutions	0	1
<i>Demand Users</i>	54	61
Manufacturing Firms	33	21
Research Organizations	6	15
Educational Institutions	11	20
Other RDC's	4	5

TABLE VIII

COMPANY SIZE OF ANNUAL MANUFACTURING
SUBSCRIBERS AT BEGINNING AND END OF REPORT PERIOD

<u>Number Employees</u>	<u>November 1, 1970</u>	<u>October 31, 1971</u>
1-25	6	5
26-50	0	0
51-100	3	3
101-250	9	10
251-500	6	4
501-1000	8	7
1001-1500	5	8
1501-2500	3	4
2501-3500	3	3
3500-over	<u>4</u>	<u>2</u>
	47	46

TABLE IX

NC/STRC's MANUFACTURING CLIENTS BY SIC CLASSIFICATION

(Annual Subscribers Only)

<u>CLASSIFICATION</u>	<u>October 31 1970</u>	<u>October 31 1971</u>
19 Ordnance and Accessories	1	0
21 Tobacco Manufacturing	1	1
22 Textile Mill Products	6	5
26 Paper Products	1	1
28 Chemicals and Allied Products	16	14
32 Stone, Clay, and Glass Products	0	0
33 Primary Metal Industries	2	2
35 Machinery, Except Electrical	3	2
36 Electrical Machinery, Equip. & Supplies	5	4
37 Transportation Equipment	2	1
38 Professional, Scientific & Controlling Instruments	1	1
39 Miscellaneous Manufacturing Industries	1	0

By far the heaviest users on NC/STRC services continue to be firms in SIC code 28 - Chemicals and Allied Products. Considering the predominant industries in the Southeastern states - textiles, with the increasing shift to man-made fibers and improved processing methods of natural fibers, and agriculture, with its demand for herbicides, pesticides, and fertilizers - this is to be expected.

As mentioned before, it is sometimes difficult to identify a visit to a plant as strictly marketing or strictly technical. All visits are considered "marketing" calls in the sense of promoting good will and additional business. Occasionally, what starts out as a marketing visit ends up as a technical conference.

However, for statistical purposes staff members record all client contacts under TECHNICAL or MARKETING depending on the basic purpose for which the contact was made. Table X below lists contacts made by the marketing and engineering staffs during this 12-month period.

TABLE X

NC/STRC STAFF CONTACTS WITH CLIENTS AND POTENTIAL CLIENTS					
<u>TYPE OF CONTACTS</u>	<u>25th Quarter</u>	<u>26th Quarter</u>	<u>27th Quarter</u>	<u>28th Quarter</u>	<u>TOTALS</u>
<i>Technical</i>					
Visits	136	58	66	170	430
Letters	117	132	158	208	615
Telephone	258	93	97	200	648
<i>Marketing</i>					
Visits	853	342	208	165	1568
Letters	375	401	325	474	1575
Telephone	218	343	262	218	1041

V. COMPUTER ACTIVITIES

A. File Activities

During the past contract period new files were investigated, and some of these were added to the computer.

1. Government Reports Announcements: The U. S. Government Research and Development Reports (USGRDR) file, which succeeded the Department of Defense (DOD) file, was renamed Government Reports Announcements (GRA). A retrospective search of the GRA file will include the DOD file. Current DOD information is included in GRA.

2. Land Use File: The first version of an experimental Land Use File, created for the Research Triangle Regional Planning Commission, has been loaded on the computer. This file was not active as of the close of the contract period.

3. Food Science and Technology Abstracts: Most of the debugging had been completed on the Food Science and Technology Abstracts (FSTA) file as of October 31, 1971. Some of the delay in processing this file was caused by physical problems on the tape. This machine-searchable file was produced from the tapes used to print Food Science and Technology Abstracts.

4. ZIP Codes: One project of the contract period was the program development and testing required to put mailing addresses for the NC/STRC newsletter, TECH TOPICS, and other marketing materials on direct access storage devices in ZIP Code order. Having the addresses on disk has reduced computer time required to print mailing labels.

5. Information Service in Physics, Electrotechnology and Control (INSPEC) File: The inversion of the sample INSPEC file by subject terms and classification codes has been completed; however, the file had not been added to NC/STRC resources by the end of the contract period.

6. International Institute for Cotton: The Research Manager of the International Institute for Cotton came to NC/STRC to discuss the use of our services to support their files and/or the institution of a complete file here. This file has not yet been created.

7. Tropical Soil Science: A file of 600 documents in the Tropical Soil Science subject area has been built for the Soil Science Department of N. C. State University.

8. Infrared Spectral Information System: A new file in the chemical area was added to the NC/STRC resources with the inclusion of the Infrared Spectral Information System (ISIS) based on the ASTM Infrared Spectral Index. Both infrared and far-infrared spectra are included in the file; therefore, the file handles both inorganic and organic compounds.

9. NC/STRC Accounting System: The NC/STRC Accounting System file was redesigned to be more flexible and provide more information. All searches are indexed by engineer, file, postings, hits, and short title. It is hoped that this inverted file permitting the grouping of data for statistical analysis will form the nucleus for a management information system.

10. World Textile Abstracts: The latest sample tape for World Textile Abstracts (WTA) was due to arrive at NC/STRC at the close of the contract period.

11. NASA/COSATI: All debugging was completed on the NASA/COSATI text tape, and an ISAM inverted search file was loaded with approximately 1100 documents. The new file appears to be in good shape.

12. Indexed Sequential Access Method (ISAM) Direct Updating: The program to directly update the ISAM inverted search file is now in good running condition and some timing/cost estimates have been made. The ITT file was used as a test file and was updated in the old way. The same file from the same update tape was then updated using a new direct updating program. This program consists of the following steps:

- invert linear update tape
- sort inverted update
- directly update inverted search file using 2. above as input.

The new method is more efficient and less expensive than the old method of recreating the inverted search file at each update.

B. Professional Activities

The staff in the computer operations section were involved in a number of meetings, trips, and visits.

1. Conference of ERIC Users: Mrs. Mary Williamson, systems analyst, attended the Conference of Educational Resources Information Center File Users in Raleigh. At the conference the possibility developed that a network of ERIC users, made up of other state departments of the executive branch, might develop around the N. C. Department of Public Instruction.

2. Symposium on Automated Methods of Computer Documentation: Miss Mason Bridenstine, computer programmer, attended this conference held at Goddard Space Flight Center, Baltimore, Maryland.

3. University of North Carolina Computation Center: Mrs. Williamson visited with the associate director of the UNC - Chapel Hill Computer Center. They discussed the ASAP information retrieval system which the UNC Center is installing.

4. Eighth Annual National Colloquium on Information Retrieval (ANIRC): Mrs. Williamson attended the ANIRC in Philadelphia. Approximately 70 persons attended the two-day session consisting of three simultaneous panel discussions.

5. City Model Game: Mrs. Williamson participated as a decision maker in the City Model Game sponsored by the National Bureau of Standards in Washington, D. C. Her role in the game was that of a member of the utilities board which came under the government sector of their model city. This model was very good and playing with it was quite an educational experience.

6. Computer-Based Information Systems: The Conference on Computer-Based Information Systems in the Practice of Pharmacy held at the UNC School of Pharmacy was attended by the computer activities staff.

7. Association for Computing Machinery: Mrs. Williamson attended the Annual Meeting in Chicago of the Association for Computing Machinery.

C. Information Resources

There are eleven files actively being searched at NC/STRC. Five of these files are searched on the computers located at other regional dissemination centers. The other six files are searchable on the computer located at NC/STRC. The total number of citations added during the contract period to five of these six files are shown in the following table.

TABLE XI

NC/STRC DATA-BASED COMPUTER FILES			
<u>FILE</u>	<u>TOTAL ACCESSION NUMBER</u>		<u>INCREASE</u>
	<u>Nov. 15, 1970</u>	<u>Oct. 15, 1971</u>	
NASA-SAL (IAA, STAR)	260,790	260,790	0
NASA-THESAURUS	191,329	242,857	51,528
NASA-A-80,000's	12,203	12,203	0
ITT	52,398	61,788	9,390
DDC RETRO	107,784	109,244	1,460
GRA		28,669	28,669
ERIC (RIE)	32,309	41,455	9,146
ERIC (CIJE)	23,753	35,900	12,147
MIT Textile File	10,478	10,478	0

Below is a brief description of the eleven files. An asterisk denotes files directly searchable on the computer at NC/STRC. The files with no asterisk are searchable at other RDC's by our cooperative arrangement with them.

*The NASA Information File, containing more than 510,000 documents, has grown at a rate of approximately 70,000 entries per year since 1962. It is only 16% NASA-generated, while most of citations are reports collected from world-wide sources for use in its aerospace program. Two journals abstract these articles: International Aerospace Abstracts (IAA) and Scientific and Technical Aerospace Reports (STAR).

*The U. S. GOVERNMENT REPORTS ANNOUNCEMENTS (GRA) file provides coverage on the physical sciences, social and life sciences, and economics. GRA**, dating from October 1970, describes various federal agencies' technical publications. A retrospective search of this file will include the 120,000 unclassified documents in the DDC file dating from mid-1964 to October 1970. Current DDC information is included in the GRA file.

The ENGINEERING INDEX (EI) file, dating from January 1968, is a monthly review of over 3500 journals, conference proceedings, and other types of publications from all parts of the world. EI gives comprehensive guides to engineering literature for engineers, scientist, and technicians. This file contains about 300,000 documents.

The AMERICAN SOCIETY FOR METALS (ASM) file contains literature announced in Metals Abstracts. The file contains approximately 160,000 items and increases at a rate of 2100 per month. Dating from January 1966, this file covers some 12,000 journals plus conference proceedings, books, and other publications.

*The EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) file is a project of the Department of Health Education and Welfare. It dates from 1968 and contains around 78,000 citations from Research in Education and Cumulative Index to Journals in Education. This file, updated quarterly contains literature aimed mainly at research in the primary and secondary education fields.

The CHEMICAL ABSTRACTS CONDENSATES (CAC) file is prepared by the American Chemical Society. This file includes the complete contents of Chemical Abstracts covering some 13,000 journals, plus a number of patents. CAC, beginning in July 1968, now indexes over 250,000 entries annually. Alternate issues deal with different areas of Chemistry, and searches are made accordingly.

CHEMICAL TITLES is a biweekly journal reporting the titles of selected papers recently published in 650 chemical journals. Each of the approximately 5,000 titles appearing in an issue can be located by the title, authors, and bibliographic citations.

**NASA reports announced in GRA are deleted by NC/STRC from this file to avoid duplication.

*The INFRARED SPECTRAL INFORMATION SYSTEM (ISIS) is based on the ASTM Infrared Spectral Index. The file consist of 100,000 infrared and far-infrared spectra handling both inorganic and organic compounds.

*The INSTITUTE OF TEXTILE TECHNOLOGY (ITT) file contains approximately 60,000 documents dating back to 1966. Abstracts are taken from Textile Technology Digest, published monthly with about 1000 abstracts in each issue. About 70% of the coverage is journal literature; about 30% is patent coverage, both from world-wide sources.

*The MASSACHUSETTS INSTITUTE TECHNOLOGY (MIT) TEXTILE INFORMATION file, containing about 10,000 items, covers the period 1950 through 1967 and is a closed file. Abstracts, including journal and patent citations, have been selected from the Journal of the Society of Dyers and Colorists and the Journal of the Testile Institute.

The BIOLOGICAL ABSTRACTS (BA) file is a consolidation of biological information from world-wide sources, obtained by review of 7400 life science journals. The file dates from 1959 and contains 1.5 million abstract references. This may be searched by one or more of four indexes: B.A.S.I.C., which includes keyword and subject indexes; author; and a biosystematic (taxonomic classification) index.

VI. MEETINGS, TRIPS, AND VISITORS

In addition to the contacts reported under marketing, NC/STRC staff members made a number of other contacts through meetings, conferences, symposia, and visits by others to the Center throughout the contract period.

Meetings & Trips

1970:

November 2-3	Miss Mason Bridenstine, computer programmer, attended the Symposium on Automated Methods of Computer Documentation at Goddard Space Flight Center, Baltimore, Maryland.
November 2-6	Colonel Lem M. Kelly, assistant director for marketing, manned the NASA exhibit of the Electronic Design News Caravan the first week of November. Representing NC/STRC and NASA, he visited nine Florida-based companies that week, saw approximately 600 visitors to the Caravan's exhibits, and distributed 223 brochures on NASA's Technology Utilization Program and NC/STRC's services.
November 30	Mrs. Mary Ann Williamson attended the Conference of ERIC File Users in Raleigh.
December 7	Miss Becky Walker, coordinator of university relations, spoke to the University of North Carolina (Chapel Hill) government documents class at the request of Professor Frances Hall of the UNC School of Library Science. Miss Walker detailed the relationship of a computerized retrieval system to government documents.
December 7-9	J. Graves Vann, technology utilization manager, attended a Conference on the Use of Ceramics in Severe Environments in Raleigh. Papers were presented by experts known worldwide in their respective fields.
December 14-16	NC/STRC director, P. J. Chenery, representing the State of North Carolina, attended a meeting of the National Governors' Council on Science and Technology.

December 18	P. J. Chenery, director, attended a meeting on the proposed State Government Research Information System at the North Carolina Department of Conservation and Development.
December 31	Mr. Chenery was the opening speaker at the kickoff for the Apollo 11 Exhibit in Raleigh. Governor Robert Scott also addressed the group.
1971:	
January 24-27	P. J. Chenery, director, attended the meeting of NASA Regional Dissemination Center Directors (ACORDD) in Denver, Colorado.
January 29	Michael Ackerman, applications engineer, spoke on the NASA Space Program, with emphasis on the Apollo 14, at the Apex Public School in Apex, North Carolina.
February 23-25	P. J. Chenery, director, attended ASIDIC (Association of Scientific Information Dissemination Centers) and NFSAIS (National Federation of Science Abstracting and Indexing Services) meetings in Washington, D.C.
March 10	Mrs. Mary Ann Williamson visited Mr. Bill Hetzel, associate director of the University of North Carolina Computation Center in Chapel Hill to discuss the ASAP information retrieval system which UNC is installing.
March 10	Mrs. Williamson visited Dr. Richard Rockwell, Center for Research in the Social Sciences, UNC, which will handle most of the 1970 U. S. Census tapes for this area.
May 4-5	M. J. Ackerman, applications engineer, spoke on "Brain Signals" at the Humanities Festival at Sanderson High School, Raleigh, N. C.
May 6-7	Mrs. Mary Ann Williamson attended Eighth Annual National Colloquium on Information Retrieval in Philadelphia.
May 12-13	P. J. Chenery, director, attended ACORDD meeting in Houston, Texas.

May 13	M. J. Ackerman attended a seminar at the University of North Carolina on the use of the experimental Medlars on-line information retrieval system.
May 28	Mrs. Williamson met with Dr. Fred Kull, director of research at Burroughs Wellcome to discuss the possibility of processing B W's internal reports files with NC/STRC-IVS.
June 1-2	Norwood Crawford and Mrs. Doris Schroeder attended the Occupational Education Instructors annual conference at Wilmington, N. C., with a display on oceanography..
June 14	Mr. Chenery attended meeting of National Governors' Council on Science and Technology in Washington, D. C.
June 24-25	Mrs. Williamson participated as a decision maker in the CITY MODEL game sponsored by the National Bureau of Standards in Washington, D. C. She also visited the ERIC Document Processing Facility.
June 30	Leon Neal, applications engineer, attended a seminar by McPherson Instrument Corporation at the National Environmental Research Center in Research Triangle Park.
August 3-5	Mrs. Williamson attended the annual meeting of the Association for Computing Machinery in Chicago.
August 6	Doris Schroeder and Norwood Crawford attended the State Public Information Officers Association.
September 14	M. J. Ackerman and Becky Walker spoke at UNC (Chapel Hill) to Dr. Leith's class in "Ecology Systems" on the NC/STRC Graduate Student Program.
September 15	Leon Neal attended the Cellular Plastics Exhibit for furniture manufacturers in Durham.
September 29-30	J. Graves Vann attended the N. C. Council for Technical and Managerial Service meeting at which he was elected the new Secretary-Treasurer. Dr. F. O. Smetana and Lem M. Kelly also attended.

October 13	M. J. Ackerman attended a seminar on the use of the Science Citation Index and Science Citation computerized literature search system at the UNC (Chapel Hill) Health Sciences Library.
October 26	Leon Neal, applications engineer, attended a three-week seminar on "Principles and Practice of Air Pollution Control" at the Research Triangle Park.
Visitors	
1970:	
November 18	Members of the Graduate Library Seminar from North Carolina Central University visited NC/STRC. Mrs. Schroeder welcomed them and spoke on NC/STRC's purpose and development. Engineer T. R. Potter addressed the group on NC/STRC operations, and Mrs. Mary Ann Williamson, systems analyst, gave a presentation on mechanized information retrieval. She also demonstrated our interactive retrieval system.
November 24	Ralph Cox of INSPEC visited NC/STRC to discuss our possible use of the INSPEC file. He also toured our facility and the Research Triangle Park.
December 7	Dr. Gertrude London and two graduate students from the University of North Carolina (Chapel Hill) School of Library Science visited NC/STRC for a seminar in mechanized information retrieval. Mrs. Williamson, systems analyst, gave a demonstration of our small real-time system.
December 9	Dr. Chester W. Clark of the Research Triangle Institute visited NC/STRC to obtain information on our services. Dr. Clark was preparing for his then imminent trip to Indonesia.
December 17	Dr. C. S. Logsdon, consultant to NC/STRC, visited here for a conference with engineer Arthur Lockwood, Lem M. Kelly, assistant director for marketing, and J. Graves Vann, technology utilization manager.

April 7	Messrs. C. W. Skinner and Gary Phillips, NCSU Computation Center, to observe a computerized information center in operation.
April 16	Dr. Ken Ellis of the Shirley Institute of Textiles, Manchester, England, to discuss the newest version of the WTA tapes.
April 20	Dr. William Martin of AATCC. M. Ducrot, director of documentation of the Institute Textiles de France, to discuss retrieval systems.
April 24	Mr. Edmond Howie, Assistant Director, Knowledge Availability Systems Center, Pittsburgh, to discuss marketing.
May 12	Dr. Gertrude London of the University of North Carolina Graduate School of Library Science brought her class to NC/STRC for a tour of the facility and seminar on computerized information retrieval. This is the third such class Dr. London has brought to NC/STRC.
May 19	Mrs. Jean Beavers, reference librarian at the University of North Carolina Health Sciences Library, visited here for instruction in search-writing.
May 21	Jeff White, independent researcher, met with Mrs. Williamson, systems analyst, to discuss possibility of obtaining old DDC vocabulary for research in automatic spelling correction algorithms.
May 26	Mrs. Crutchfield, Medical College of Pennsylvania, visited with M. J. Ackerman to discuss available medical data bases.
June 1	Two representatives from Celanese in Charlotte visited NC/STRC to explore processing of World Textile Abstracts tapes.
June 3	Miss Peg Schaberg, coordinator for the State Library Network, met with Mrs. Williamson to discuss computer processes in statewide library system.

1971:

January 12

Dr. Lawrence A. Nelson, professor of experimental statistics, Dr. Eugene J. Kamprath, professor of soil science, and Mrs. Patricia Patrick, information specialist for the Soil Science Department at North Carolina State University came to NC/STRC to discuss the possible development of a Soil Science file. They conferred with Mr. Chenery, Mr. Kelly, and Mrs. Williamson. The group has received a federal grant for this purpose and will work with Mrs. Williamson on the file.

January 15

Brian Jones, manager of Durable Press Research at Cotton, Inc., and Allan Heap, research manager of the International Institute for Cotton in Manchester, England, visited NC/STRC to discuss how our information services might support them. They conferred with P. J. Chenery, director, Lem M. Kelly, marketing, and Arthur Lockwood, engineer. They toured NC/STRC and TUCC and were given a demonstration of our on-line textile file.

January 18

Robert Thornton and James Wright, both of the Operations Division of Research Triangle Institute, came to NC/STRC to discuss automated information systems with Mr. Chenery, Mr. Kelly, and Mrs. Williamson. Under contract to the Justice Department, Messrs. Thornton and Wright are seeking to develop an information system for that department.

January 28

Robert Henson, President of Flexible Products Company, Marietta, Georgia, visited NC/STRC in hopes of finding some way to expand his liquid plastics compounds business. He conferred with Mr. Vann, Mr. Kelly, and Dr. F. O. Smetana, assistant director for operations. Mr. Henson's interest was initially roused by an article in Plastics World.

January 29

Dr. Lawrence Sherman of the Chemistry Department of North Carolina Agricultural and Technical State University in Greensboro, North Carolina, visited NC/STRC to learn how he might teach their chemistry students the philosophy and skill of computerizing searches for information retrieval. He met with Mr. Kelly, Mrs. Williamson, Miss Walker and Mr. Lockwood, and was given a demonstration of our on-line textile file.

February 3	Messrs. George Marienthal and Wayne Scott with Logistics Management Institute, Washington, D. C., to discuss the utilization of NASA technology.
February 11-12	Staff members from the N. C. Department of Conservation and Development, Commerce and Industry Division to view first-hand an operation which serves industry in the State.
February 18	Mrs. Pat Patrick, information specialist with the Soil Science Department, N. C. State University. Mr. Mike Keifer, vice president, and Mrs. Pam Perry, electronics engineer, Triangle Environmental Corporation in Raleigh, seeking assistance on a pollution monitoring device.
February 25	Mr. Phil McGill, Research Triangle Institute, for information on the ERIC file.
March 4	Dr. C. S. Logsdon, marketing consultant, visited the Center to confer on promotional materials.
March 5	Dr. L. Sherman and class from the Chemistry Department, N. C. A & T State University, Greensboro, to learn about computerized information retrieval.
March 25	Mr. Robert Merkel of the Institute of Textile Technology, Charlottesville, Va., who is studying operation of a center such as NC/STRC as part of his doctoral research.
March 29	Dr. Gus Harrer, University of Florida Library Director, interested in more information on the library search service.
March 29	Mr. W. Epps, graduate student in School of Design, NCSU, interested in computerized data systems.
April 5	Science students from the E. E. Smith High School, Fayetteville, N. C.
April 6	Dr. D. B. Moore, Shirley Textile Institute, Manchester, England.

June 15	Miss Margo Perkins and George Smith of UNC-TV in Greensboro who were gathering material for a TV series on the uses of math. They were especially interested in 3-D weaving as developed by AVCO.
July 20	Dean Carl Dolce of the School of Education, NCSY, and Dr. Barry Lumsden, Director of Adult Learning Center, NCSU, met with Mr. Chenery to discuss mechanized retrieval systems.
August 5	Dr. Neil Webb, Southern Testing and Research Laboratory, met with Lem M. Kelly to discuss our addition of the Infrared Spectral Information System.
August 26	Dr. Frederick Kull of Burroughs Wellcome visited NC/STRC to discuss a search of Chemical Abstracts.
August 27	Six representatives from the Virginia Commonwealth University met with A. W. Lockwood to discuss the ISIS file and Chemical Abstracts file.
August 27	Four librarians from Virginia Commonwealth University and the Research Librarian from the Virginia Department of Vocational Rehabilitation visited for instructions in search writing techniques.
September 9	Dr. David Dunthorn, who is with Union Carbide at Oak Ridge, visited with A. W. Lockwood, applications engineer.
October 6	Dr. Fleming of the Food Science Department at NCSU met with A. W. Lockwood and Mrs. Williamson to discuss the FSTA file.
October 19	Mr. Paul W. Speltz, marketing manager for New England Research Applications Center, Storrs, Connecticut met with P. J. Chenery and Lem M. Kelly to discuss NC/STRC capabilities, resources and cost of service.
October 29	Mr. Ronald Simpson, Mr. Robert Pollard, and Miss Ervene Purcell of the D. H. Hill Library, NCSU, visited here to familiarize themselves with our services.

APPENDIX A
TRANSFER CASES

CASE NO. 132

Burlington Industries, through information supplied by NC/STRC from the NASA information file, has developed a new finish for glass fabrics used in epoxy laminates. Purchasers of this fabric are the high pressure laminators, including General Electric and Westinghouse, who fabricate the copper-clad laminates. These laminates are then sold to companies which fabricate printed circuit boards. According to Dr. Lotz, Director of R&D for Burlington, these circuits are used in computers, television receivers, and a variety of commercial and military aircraft.

The new glass finish, said Dr. Lotz, results in better bonding of resin to glass and this, in turn, gives higher physical properties in the laminate. The flexural strength of the laminate under wet conditions is about 25,000 psi without the finish, and rises to about 60,000 psi with the finish. Also, there are increases of from 50% to 100% in the tensile strength and compressive strength of the laminate when the finish is used.

Dr. Lotz cited several documents as being particularly pertinent:

N69-36599	Surface Chemistry of Plastics Reinforced by Strong Fibers
N70-15981	The Function of Adhesion Promoters in Adhesive Bonding
N69-29625	Wetting of Low-Energy Surfaces by Nonaqueous Solutions of Dimethyl Siloxane-containing or Fluorocarbon-containing Surfactants
AD-679 116	Role of the Interface in Glass-Epoxy Composites

CASE NO. 133

A North Carolina based firm, Cornell-Dubilier Electronics, reports that information retrieved through a NC/STRC search greatly contributed to the evaluating and testing of new electrolytes for electrolytic capacitors.

In the NASA CR-1425, "Properties of Nonaqueous Electrolytes", the investigation of an organic salt, tetramethylammonium Hexafluorophosphate, for use in battery electrolytes is mentioned. Cornell-Dubilier's

investigation of the acid in this salt for use in electrolytic capacitor electrolytes gave superior performance to any electrolyte previously tested. The resistance of a typical electrolyte with this salt is less than 100 ohms while a comparable electrolyte now in use without this new salt has a resistance in excess of 400 ohms. At present they do not have this electrolyte in production.

Further, retrieved literature referred to the use of N, N-Dimethyl Formamide as an electrolyte solvent. This electrolyte is used in several of Cornell-Dubilier's newest product capacitors designated as:

UHL

UHH

UHT

UFH

CASE NO. 134

The Texaco Research Laboratories in Richmond, Va., have estimated savings in the range of 50%-75% through use of NC/STRC search services in lieu of their own staff's capabilities. In a letter dated March 14, 1972, Mr. R. J. Agnew, manager, states:

"These savings were obtained because of the efficiency of the computerized information system employed by NC/STRC in comparison with the manual techniques which the client otherwise would have had to employ. The client also expresses satisfaction in being able to obtain professional services of this sort on a timely basis, thereby relieving them of having to maintain a comparable in-house staff capability."

In addition to the actual cost savings, this company says the information supplied by NC/STRC enabled them to develop new techniques and instrumentation for dealing with problems of materials handling and directed further research in another area. Coverage of research on one subject back to 1940 gave this client an enlightened view of the current state of the art and the direction its effort should take in further research on the subject.

CASE NO. 135

A search of NASA documents on the subject of epoxy curing agents led to the development of a superior curing agent utilizing the client's by-products of amines and diamines.

ArChem Company, Houston, Texas, ordered a number of technical documents and several back-up Tech Brief packages from a search bibliography, and in these found the information which led to a new product. Although ArChem plans to market this curing agent in the foreseeable future, it has not at this time reached final production stage. The volume of the product is expected to be relatively small for ArChem and they would prefer to sub-contract the actual manufacture of the curing agent.

The original idea for the search was the brain-child of an engineer who had moved from Columbia Products, where he had utilized NC/STRC services, to ArChem. Noting ArChem's by-products, he felt these might profitably be used and requested the search on epoxy curing agents.

CASE NO. 136

In January 1971, AVCO/Lycoming at Charleston, West Virginia, requested a bibliography on sampling of gaseous emissions from gas turbine engines. This bibliography was to support a proposal effort in partnership with another AVCO division.

As a result of the bibliography, several documents were requested on a rush basis and these were supplied within two days. At a meeting between engineers from the two AVCO divisions, it was learned that the second division had been trying, unsuccessfully, for several months to obtain these particular documents which were specified in the RFP as basic to the proposal effort. The Charleston division was able to supply the needed documentation for the proposal effort, thanks to NC/STRC services.

APPENDIX B

EXHIBITS

TIME RECORD

CLIENT NUMBER _____ SEARCH NUMBER _____ DATE _____ ENGINEER _____ S/N _____

SEARCH TITLE _____ REMARKS _____

FILE	ENGINEERING		LOAD SHEET		ABSTRACTS			DATE RUN COMPUTER	POSTINGS	INTERSEC	HITS	TERMS	EVAL. HITS	COMPUTER TIME				
	In.	Time	In.	Time	Date	Time	Pages Printed											
(1) NASA-SAL																		
(2) NASA-THE																		
(3) ITT																		
(4) DDC - 64-68																		
(5) DDC - 69-																		

DOCUMENT PROCEDURES

RECORDAK PRINTING

Initial Date Time Spent No. Pages

HARD COPY PROCEDURES

Initial Date Time Spent

MISCELLANEOUS TIME

Initial Date Time Spent

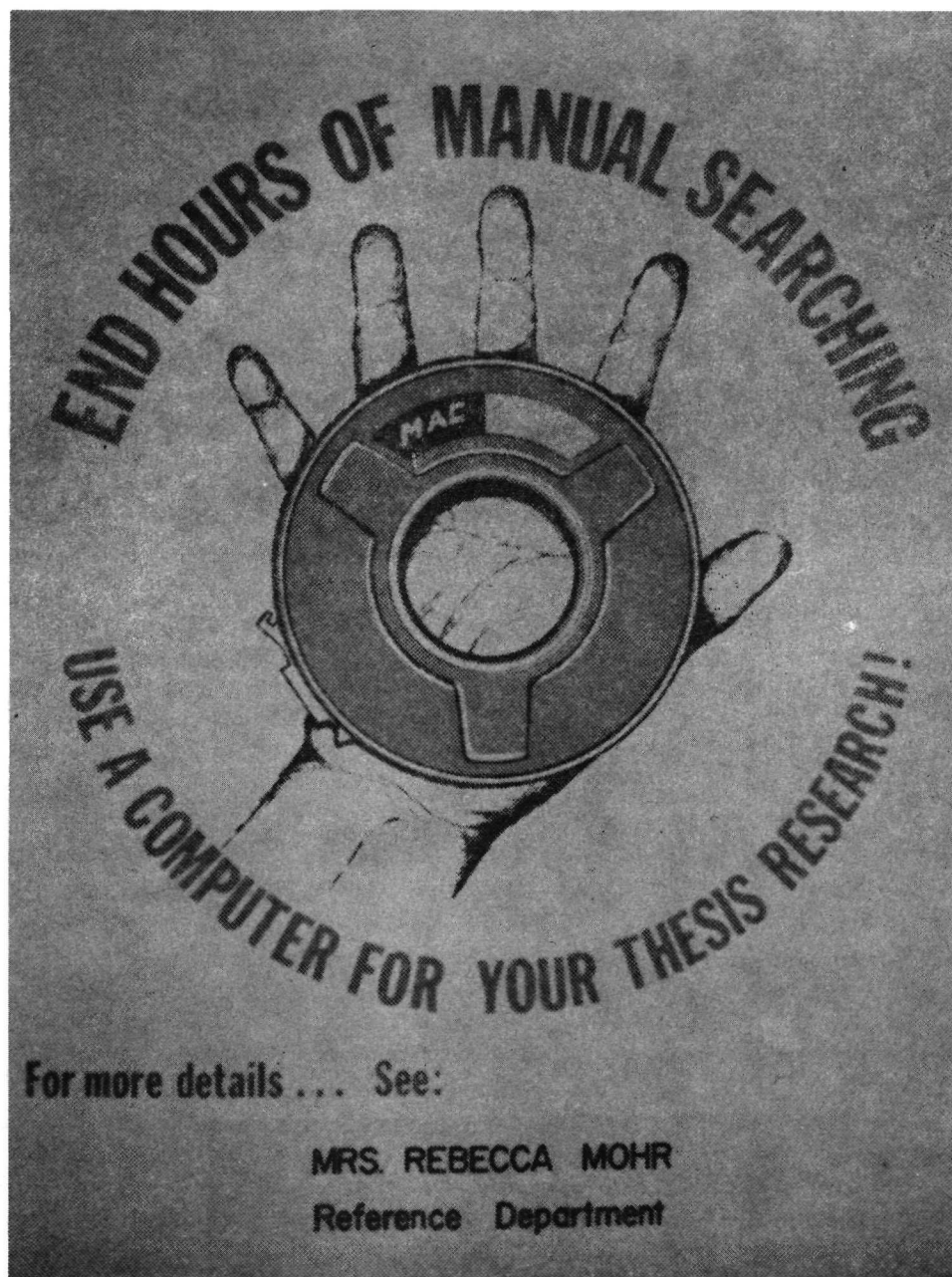
Documents Sent:

Type No. Pages Cost

Postage:

Date Amount

TWX Number: 510-927-1804



NC

STRC

TECHNICAL BULLETIN

ISSUE NO. 3 - JULY 1971

For additional information or complete documentation on any item, use the orange post card enclosed for your convenience. You may forward the indicated price or NC/STRC will bill you.

* * * * *

The response to this bulletin continues to be excellent. However, don't wait for an item of interest to appear - contact NC/STRC concerning your current interest or problem.

* * * * *

Last year, NASA announced two companion reports made by the Air Force Systems Command. The first describes the influence of a variety of motor oils on the operating indices of internal combustion engines. The second reports on the properties of motor oils containing various additives. These should constitute a ready reference set.

NEED AN OIL
CHANGE?

Item No. 301
(\$3.50)

Item No. 301A
(\$3.50)

The conversion of the system of weights and measures has begun in the United States. As time goes by, more and more use will be made of the International System of units (metric system). The American Society for Testing and Materials has recently published a *Metric Practice Guide* which is a timely help in converting inches and pounds to meters and kilograms.

THE METRIC
SYSTEM IS
HERE TO STAY
Item No. 302
(\$3.00)

For those concerned with plastics technology, NC/STRC has assembled a bibliography of the PLASTEC series of reports and notes coming from the Plastics Technical Evaluation Center at Picatinny Arsenal. This is an excellent reference to the broad area of plastics technology from which you may select items of specific interest to you. Such items as other bibliographies, laminated plastics, reinforced plastics, foamed plastics, applications and processing of plastics are well covered.

ALL ABOUT
PLASTICS
Item No. 303
(\$2.00)

Numerical control has reached the apparel industry as has the laser - this must be great news to a labor intensive industry that, until recently, has seen little mechanical innovation since Elias Howe. *Business Week*, June 12, 1971.

A STITCH IN
TIME SAVES --
Item No. 304
(Free)

Those concerned with testing of electronic components - are you automating your test facilities? A recent NASA report, *Automatic Test Equipment for Electronic Components* in a two-volume set, defines an automatic test facility for testing discrete and integrated components. The full development of the facility from economic and technical considerations is covered. Volume I (305) is a summary, Volume II is the final report in detail (305A).

EFFICIENCY IN
ELECTRONIC
TESTING
Item No. 305
(\$3.50)
Item No. 305A
(\$3.50)

THE STATE OF
THE ART -
ELECTRONICS
Item No. 306
(\$4.00)

Electronic Assembly Technology - for those concerned with the fabrication of electronic components and assemblies - here is an annotated bibliography covering the current state of the art. The attempt is made to present practical technology rather than electronic theory and experimental results.

MAKING CLEAN
PRODUCTS AND
KEEPING THEM
CLEAN
Item No. 307
(\$3.50)

A very complete handbook on *Contamination Control* has been published by NASA. This is an excellent guide to contamination control through design of processes, equipment and facilities and product. Contamination sources are identified and processes and hardware are evaluated in relation to the service environment. Packaging, storage and operating personnel requirements for control and preservation of contaminant free products and materials are presented.

NEW WAYS TO
SKIN SOME OLD
CATS
Item No. 308
(\$1.50)

A compilation of simple tools and devices for performing more or less special jobs has recently been published by NASA. Most of the devices incorporate or modify standard tools such as pliers, wire cutters, drills and clamps to facilitate the performance of a number of frequently occurring functions. Any fabricator or machinist of metals, wood, plastics or electrical/electronic assemblies would find this reference useful.

WHERE, HOW
WHAT OF SOUND
AND NOISE
Item No. 309
(\$1.00)

A survey of *Acoustics Technology* has been published by NASA which reviews the subject from Lord Rayleigh and 1896 to the present. An extensive bibliography is included with a review of noise generation, acoustic propagation, noise effects, tests, measurement and instrumentation.

WILL CLEAN
AIR COST
MUCH?
Item No. 310
(\$3.50)
Item No. 310A
(\$6.50)

The cost of air pollution control is a significant item of expense to industry and government even now. Industry is yet to feel the full effects of continuing and completely developed systems of control. Two companion reports are available giving estimates of costs to be expected in controlling selected pollutants from industrial, municipal, governmental and mobile sources. The first study (\$3.50) is of selected industries (22) in 100 metropolitan areas. The second (\$6.50) covers mobile sources on a national basis and three major categories (solid waste disposal, stationary fuel combustion, industrial processes) for 298 metropolitan areas.

DISPOSAL OF
WOOD WASTE
Item No. 311
(Free)

A timber company in California has achieved an industry "first" in burning wood wastes that substantially reduces particulate emissions into the air. The particular waste which this company disposes of is redwood bark. Previously, this waste was burned in "teepee" burners which belched smoke at around Ringelmann No. 4 and sprayed cinders into the air. The new burner operates below Ringelmann No. 1. The burner combines three advanced features: (1) an adequate amount of air under the fire; (2) the shell is insulated; and, (3) automatic gas controls to maintain a high temperature.

THERMAL
REACTORS AND
POLLUTION FROM
AUTOMOBILE
EXHAUST
Item No. 312
(\$3.50)

As a part of its program to find more effective means of reducing the amount of pollutants emitted in automobile exhausts, the National Aeronautics and Space Administration has been evaluating manifold thermal reactors. The first report on the results of tests conducted on two thermal reactors is now available. Preliminary findings are that currently the thermal reactors do not approach the emission requirements for hydrocarbons proposed for 1975. The prime reason for this appears to be the fact that the temperatures in the reactors are not high enough to achieve the desired efficiency (i.e., temperatures are well below 1340°F).



North Carolina Science and Technology Research Center

RESEARCH TRIANGLE PARK, N. C. 27709

P. O. Box 12235

Telephone: (919) 549-8291
TWX Number: 510-927-1804

May 7, 1971

Dear Sir:

As you will recall this information center was created in 1964 as a non-profit public agency. Its mission is to aid in the transfer of research results and new technology from their points of development to the points of incorporation into new products and services for the consuming public. This center's part in the process of transfer has been one of information handling, evaluation and assistance in application. A multi-discipline, technically trained staff has been assembled to search out and evaluate documented information and to provide expertise in response to specific requests from clients.

In the course of seven years this center, employing professionals with industrial background and the most modern systems of information storage and retrieval, has developed a broad capability for satisfying your information requirements.

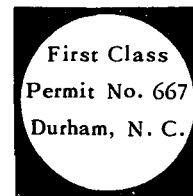
The variety of items presented in the Technical Bulletin will suggest the scope and nature of the material available to provide depth of background, problem solutions, the basis for sound decisions, and new ideas in your interest areas. It is published as part of a continuing effort to stimulate the use of this new technology.

Sincerely yours,

Peter J. Chenery

Peter J. Chenery
Director

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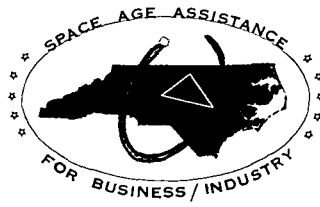
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North Carolina Science and Technology Research Center

UNIVERSITY LIBRARY SURVEY

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3. Do you have or are you contemplating the establishment of internal computerized information retrieval?
4. Would greater access, at a nominal cost, to current (last 10 years) report and journal literature from outside sources be helpful to your patrons?
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North Carolina Science and Technology Research Center

RESEARCH TRIANGLE PARK, N. C. 27709

P. O. Box 12235

Telephone: (919) 549-8291
TWX Number: 510-927-1804

June 4, 1971

Dear (Librarian):

Through joint funding by the State of North Carolina and the federal government, the North Carolina Science and Technology Research Center (NC/STRC) operates a non-profit information dissemination facility serving the Southeast. Although most of our computerized information resources support the scientific and technical disciplines, two offer assistance in the social sciences - Educational Resources Information Center (ERIC) and Government Research Announcements (GRA). Most of these collections are familiar to you already, since the abstract journals which announce new input are frequently found in university libraries.

The service we render is simply a time-saving device to make the job of searching these resources easier. Since our operations are highly subsidized by government funds, we charge users only direct costs.

The enclosed survey is intended to identify specific information needs and interests within the university community. By taking a few minutes to answer these questions, you will materially assist us in determining ways in which our services can attain maximum effectiveness.

As a very specialized library, we are interested in coordinating our efforts with those of traditional library facilities. I hope that I may expect your early reply.

Sincerely yours,

(Miss) Becky Walker
Coordinator of University Relations

Enclosures