Fourth Annual Report

THE SPACE AND TECHNOLOGY TRANSFER PROGRAM

at the

University of Pittsburgh

Submitted to

The National Aeronautics and Space Administration

June 1968

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Fourth Annual Report

THE SPACE AND TECHNOLOGY TRANSFER PROGRAM

at the

University of Pittsburgh
Knowledge Availability Systems Center

Submitted to:

The National Aeronautics and Space Administration

June 1968

Prepared by:

Edmond Howie
Assistant Director

Approved by:

Allen Kent
Director

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I. SUMMARY

The Knowledge Availability Systems Center RDC activity at the University of Pittsburgh increased its industrial income 18% over the previous year (1966). Total income was $92,064, of which $54,446 was renewal income and $37,618 was new income. The renewal income reflects a 55% increase over the renewal funds of 1966. However, the new income is 13% less than that of the previous year.

During the reporting period, KASC served 91 individual clients. This included 81 clients served during the calendar year 1967 and 10 new clients during the first two months of 1968. The composition of these clients comprised 27 new companies, 36 renewals, and 19 dropout companies, all on an annual basis. In addition, there were 9 one-time customers (retrospective only).

The scope of service furnished industrial participants included the processing of 1481 individual profiles: 968 on a current awareness basis; 163 on a retrospective basis; and 350 on both a retrospective and current awareness basis. These profiles were searched 12,474 times. There were 513 retrospective searches and 11,961 current awareness searches.

The total number of citations retrieved was 427,739. After evaluation by subject specialists, 119,166 abstracts were forwarded to clients. In the opinion of KASC personnel, 27.8% of total search output was deemed relevant.

Clients evaluated only 64% of submitted material. However, his evaluation indicated that only 70.5% of material delivered was

relevant to his profiles, 19.5% was non-relevant and 10% was relevant to other interests.

KASC provided a total of 20,168 'A' and 'N' documents to its clients during the reporting period: N-documents totaled 10,789; A-documents totaled 9,379. On a unique profile (1481) basis, this averages out to 13.6 documents per profile.

KASC efforts to document RDC impact is to be redirected. Until recently, all such efforts have been concentrated on the identification of transfers in the narrow sense of the word. However, such transfers almost invariably have been associated with problem-solving profiles. At KASC, 89% of total service was comprised of current awareness and 11% of retrospective service. Also, the majority of retrospective profiles were not of the problem-solving type. Thus, impact reporting efforts at KASC were misdirected and results were minimal.

A cost analysis of the KASC RDC activity indicated the existing fee schedule did not reflect an accurate picture of the true cost structure of a service element. New fees have been established and are to be introduced during the coming year.

The KASC activity continues to grow. Now entering its fifth year, the impact of KASC on the University of Pittsburgh has been so great that it is no longer possible to describe in a brochure the program of the Center; rather, it is necessary to describe the information or communication science activity of the University as a whole.

II. INTRODUCTION

This report is submitted in fulfillment of the requirements of the National Aeronautics and Space Administration Contract No. NSR 39-011-070.

The period of performance, as stated in Article II of the Contract, is [March 1, 1967] through February 28, 1968. However, the calendar period spanned by various statistics in this report will vary (depending on available records) but in all cases will include the time span of the Contract.

The report is prepared in four sections: Section I summarizes the report and reflects what we think are the highlights of the year's operation. Section II is intended to introduce the reader to the format or method of presentation and to indicate the type of information he may expect to find in the individual sections. Section III presents a general picture of the mission and organization of the Knowledge Availability Systems Center (KASC) of the University of Pittsburgh. Section IV describes the organization of the RDC activity at KASC and the scope of marketing and operations activities during the reporting period. This last section includes progress towards the goal of self-sufficiency.

In addition to these four sections there are three appendices. Appendix A contains brief resumes of subject analysts; Appendix B has some sample marketing letters; and Appendix C contains letters from participants expressing their opinions about the NASA/KASC program at the University of Pittsburgh.

III. KNOWLEDGE AVAILABILITY SYSTEMS CENTER ORGANIZATION

INTRODUCTION

The organization that was charged with the responsibility for developing a University-wide posture in the information sciences has been the Knowledge Availability Systems Center. The Center was established in 1963 with a 'charter' to develop a program of teaching, operations and research in this field.

The administrative organization of the KAS Center is shown in the chart in Figure 3-1. The activities relating to regional dissemination functions are shown in the right side of the chart (under E. Howie, Assistant Director). The research and report coordination functions are shown in the center part of the chart (under E. D. Dym, Assistant Director). The direct research functions are shown in the left (lower) side of the chart (under A. Kent, Director). The shaded area on the left side (top) of the chart illustrates the relationship of the KAS Center research activities with University units reporting to the Provost (C. Peake) and to which the Center provides senior personnel.

TEACHING PROGRAM IN THE INFORMATION SCIENCES

The teaching program has developed to the point where formal curricula (involving 15 new courses and seminars) at the masters and doctoral levels, with majors and minors in the information sciences, are available from the KAS Center to a number of schools and departments of the University, including:

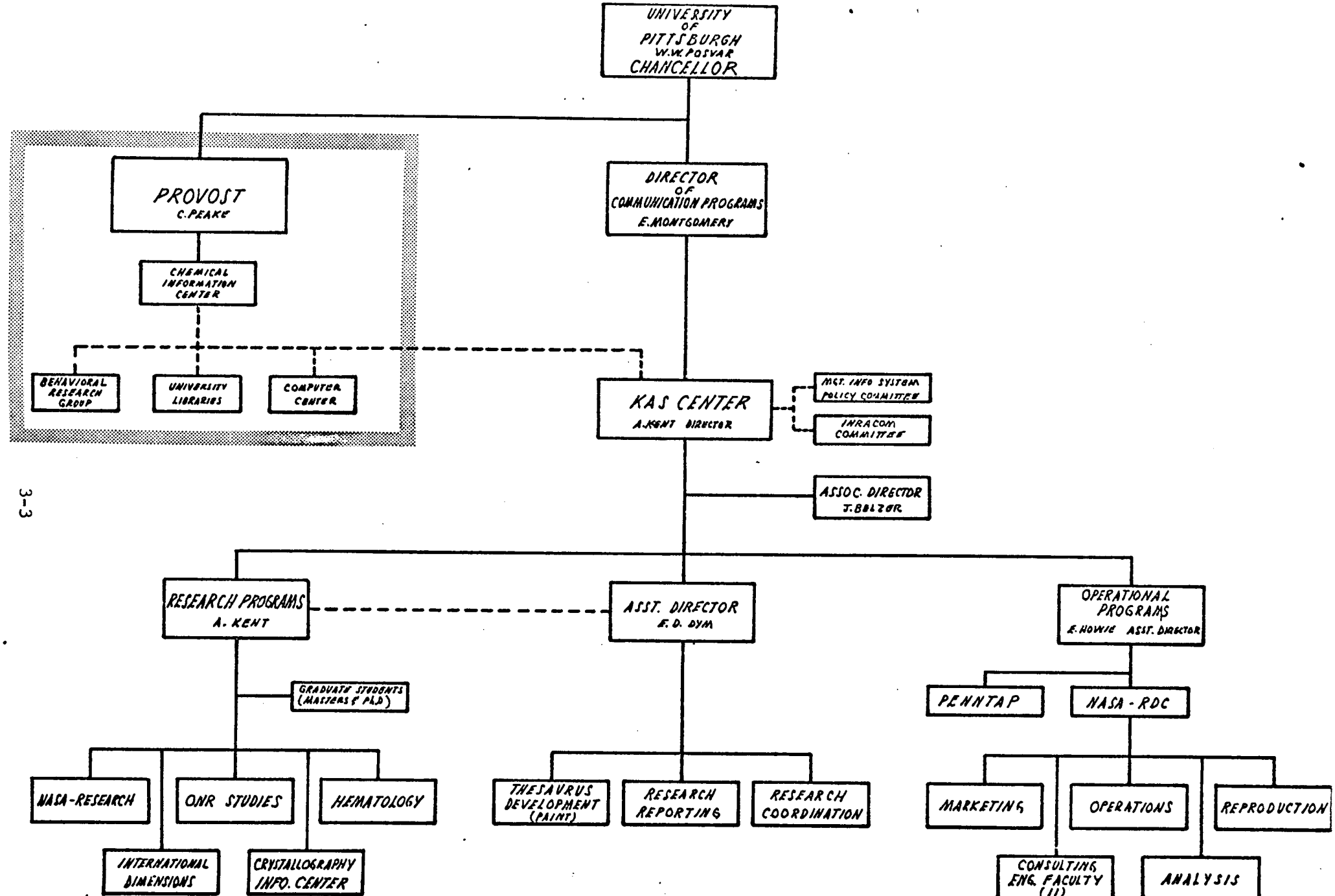

Figure 3-1. KASC Organization - Administrative

Graduate School of Library and Information Sciences
Department of Industrial Engineering, Systems Management Engineering, and Operations Research
Department of Computer Science
Department of Educational Communications
Department of Special Education and Rehabilitation
Department of Educational Research

In addition, students from psychology, philosophy, public and international affairs, and business, among others, have enrolled in selected courses in these curricula. During 1967, some 750 students enrolled in these new courses and seminars. Six doctoral candidates are currently in the process of writing their dissertations in this field.

The chart in Figure 3-2 illustrates the academic involvement of the KAS Center, with various of the senior staff participating in the teaching program through joint appointments. Examples are the Director (A. Kent) holding professorships in the Graduate School of Library and Information Sciences (GSLIS), the Department of Computer Science, and the School of Education; the Associate Director (J. Belzer) holding academic appointments in the Department of Industrial Engineering and GSLIS; one research associate holding appointments in the Department of Computer Science and GSLIS; and another research associate having an appointment in the Department of Industrial Engineering. In addition, a number of doctoral students participate in offering courses in GSLIS at the masters level.

OPERATIONS

The operations program has developed to the point where several computer-based files are being searched for the benefit of faculty,

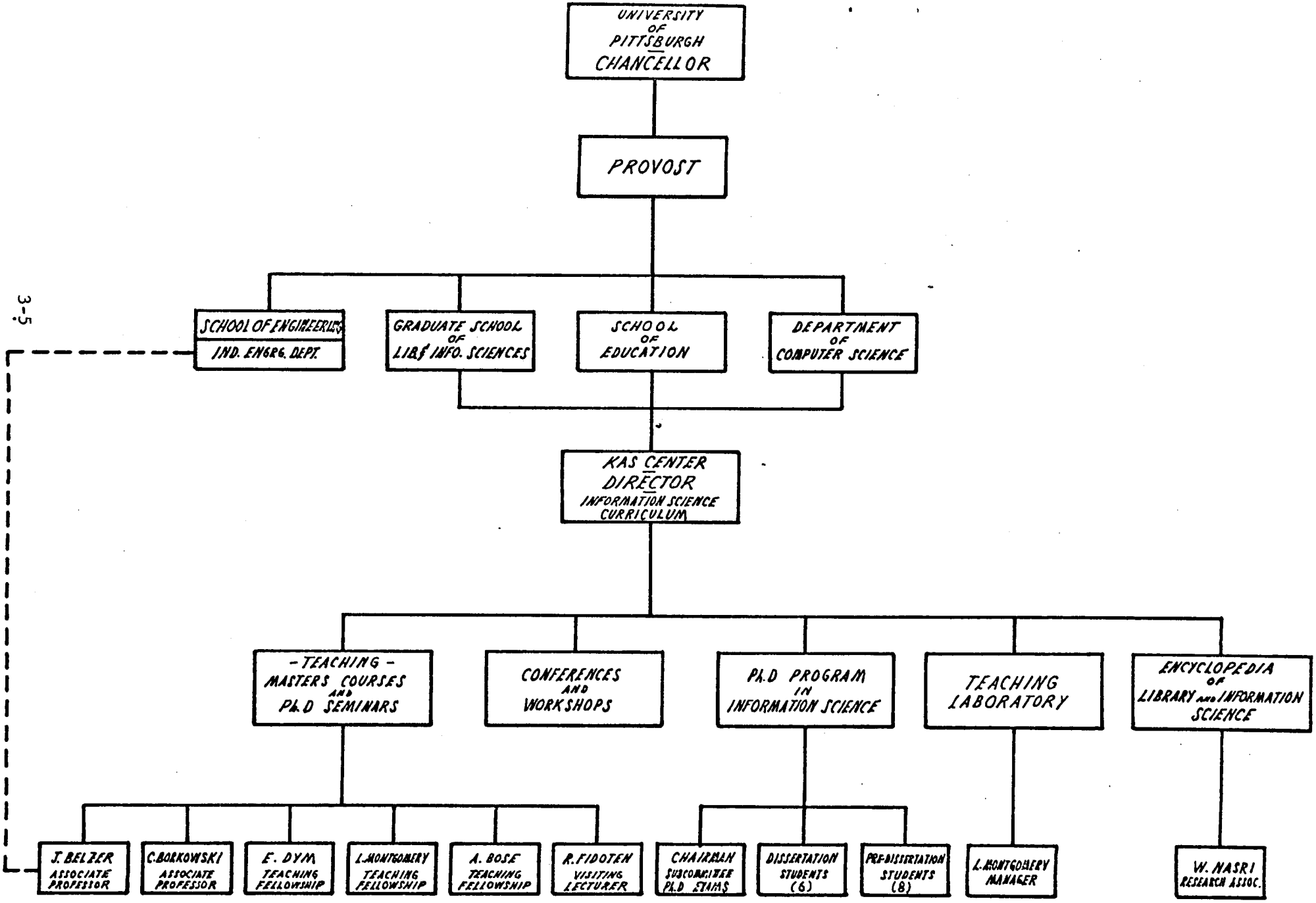

Figure 3-2. KASC Organization - Academic

students, and industry. The operational projects include:

NASA Regional Dissemination Center
Crystallography Information Center
Pennsylvania Technical Assistance Program Information Switching Center
Chemical Information Center

RESEARCH

The research program has involved the development of some 17 projects in basic areas of concern, including relevance predictability, interactive information retrieval systems, game theory in systems design and operation, learning-relevance relationships, thesaurus development and testing, and comparative indexing.

IMPACT OF KAS CENTER ACTIVITIES

The activities of the Center, stimulated by the NASA support of the regional dissemination center, has led to the determination on the part of the administration of the University of Pittsburgh to pursue aggressively the operational aspects of the program in light of:

1. The understanding of the importance to our society of pursuing the goals of transfer, however difficult they may be to achieve and recognize.

2. The desire to extend the teaching-research-service commitment of the University beyond its walls into industry and other institutions that make up its environment.

3. The very dramatic effect the activity has already had on many related University programs, such as the following:

   (a) Stimulated the development of the graduate information science curriculum and strengthened the Graduate School of Library and Information Sciences to the point where it is now the largest in the country, although it was one of the smallest four years ago.

(b) Provided the basic files and methodology for the development of the Information Switching Program of PENNTAP (the Pennsylvania State Technical Services activity).

(c) Produced the proper environment within the University which made it possible to develop:

(1) The Chemical Information Center Experiment Station (financed by National Science Foundation).

(2) The Crystallography Information Center (financed by National Institutes of Health).

(3) A Communication Science program development (financed by the newly created Pennsylvania Sciences and Engineering Foundation).

(d) Provided internships in information systems operation for some 30 graduate students in engineering, and library and information sciences, a number of whom have already graduated and are using the skills they acquired in industry, government, and universities.

(e) Provided research topics for a number of doctoral and masters dissertations. Nine of these dissertations have been in industrial engineering, with the remainder in library and information sciences.

(f) Provided incentive and environment for the planning of a new Engineering Services Division of the School of Engineering which would undertake information dissemination and consulting programs for industry.

(g) Provided incentive and environment for the formation of a new Office of Communications Programs within the University, which brings together the KAS Center, the Computing Center, The University Libraries, and the Council on Social Science Data Archives.

(h) Provided the environment which permitted the recruiting of several senior faculty to the University in the information sciences.

(i) And, last, strengthened the general University Development program in its relationships with industry.

These developments have occurred since the establishment of the KAS Center almost five years ago, and the term 'KAS' has been diffused

into the thinking of many elements of the University. As a matter of fact, it would be safe to say that the understanding of the term has become so diffused into current and planned programs that there is a risk that the identity of the KAS Center may be lost before many more years have elapsed. In a sense, this loss of identity has begun already, and it is no longer possible to describe in a brochure the program of the Center; rather it is necessary now to describe the activity as 'information science' or 'communication science' at the University of Pittsburgh.

IV. NASA/PITT TECHNOLOGY UTILIZATION PROGRAM

- RDC Organization
- Engineering Consultants
- Analysis Section
- Marketing
- Technical Operations
- Document Service
- RDC Impact Reporting
- Progress Toward Self-Sufficiency

RDC ORGANIZATION

The organization of the NASA Regional Dissemination Center (RDC) at the University of Pittsburgh is shown in Figure 4-1. As the illustration indicates, the RDC comprises four major activities: marketing, engineering consulting, analysis, and technical operations.

Document reproduction has been organized as a separate entity to facilitate implementation of complete 'in-house' N-document service activity. This approach is intended to relieve Technical Operations of document production activities and to permit them to concentrate completely on improving the timeliness of all service up to and including delievery of search results to the customer.

There are 44 personnel assigned to the NASA RDC at KASC. This total does not include the Director of the Center, his administrative assistant, nor his secretary, who maintain a degree of administrative control and considerable budgetary control over the program.

Twenty-three of the personnel assigned to the RDC activity effort are full-time professional and clerical staff of KASC. Supplementing this main cadre are six part-time professional and four part-time clerical employees. The remaining 11 personnel include 10 full-time faculty and staff of the School of Engineering and one faculty member of the Department of Pharmacology.

ENGINEERING CONSULTANTS

The engineering consultant group, comprising 11 personnel, serves KASC on a functional basis. This group is administered by Dr. A. G. Holzman who is Chairman of the Industrial Engineering Department.

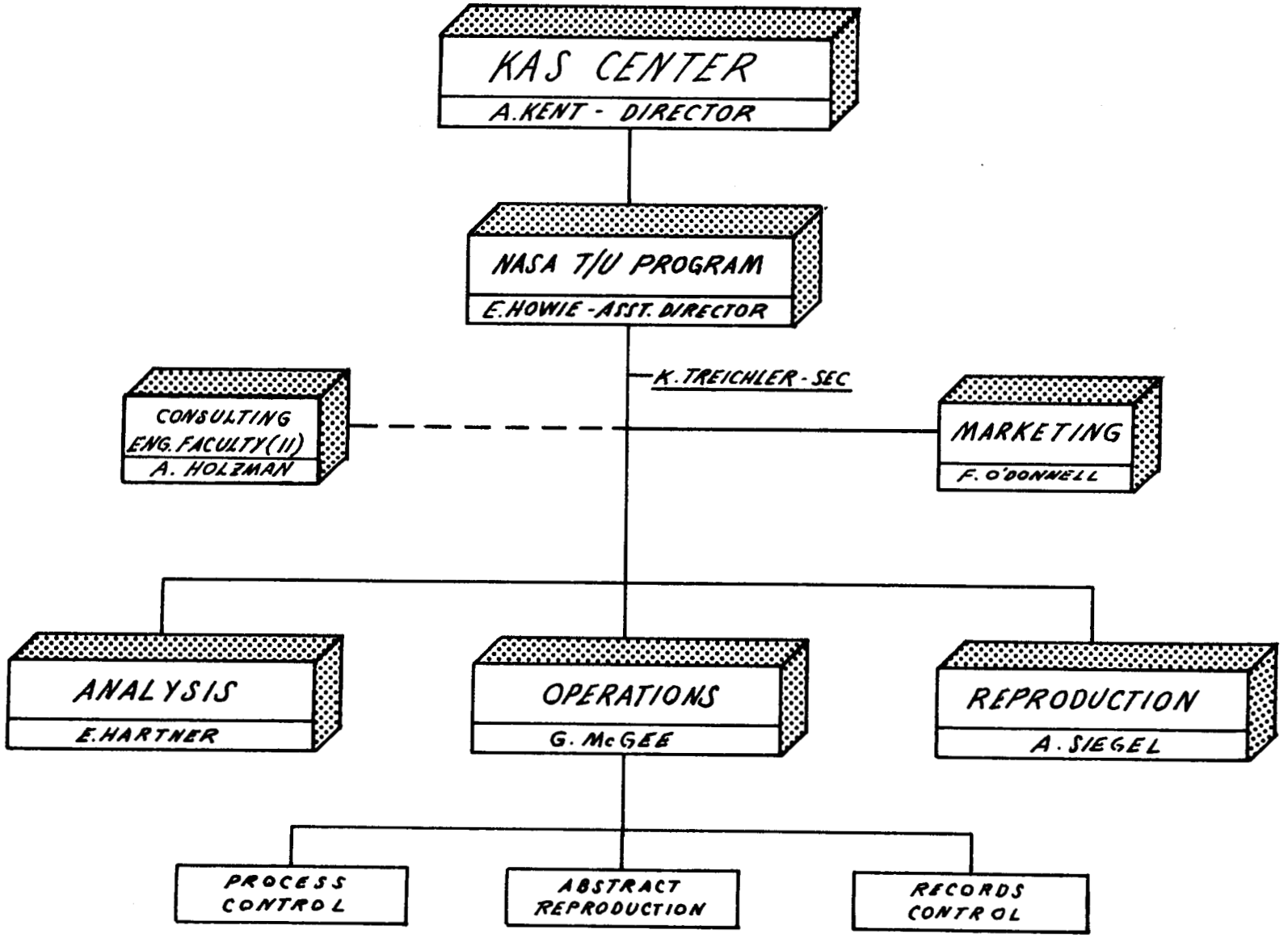

Figure 4-1. NASA/Pitt RDC Organization

The group also includes the Associate Dean of the School of Engineering, Walter R. Turkes. Dean Turkes' responsibility is to maintain periodic client contact at the managerial level to advise the KASC Assistant Director of action needed to improve client exploitation of the NASA files.

The remaining members of the consulting group are identified as follows:

Buckley, Joseph P., Ph.D.	Professor, Chairman, Department of Pharmacology School of Pharmacy
Coull, James, Ph.D.	Professor, Chemical and Petroleum Engineering
Geiger, Gene E., Ph.D.	Associate Professor, Mechanical Engineering
Gratton, Mercer.	Assistant Chairman, Metallurgical and Materials Engineering
Greaney, William A., Ph.D.	Associate Professor, Industrial Engineering
Hamilton, Howard B., Ph.D.	Chairman, Electrical Engineering
Miller, James P., Ph.D.	Associate Professor, Civil Engineering
Sze, Tsung Wei, Ph.D.	Professor, Electrical Engineering
Trout, Harry E., Jr.	Assistant Professor, Metallurgical and Materials Engineering

Dr. Holzman is responsible for establishing technical contact with new participants in the program and maintaining technical liaison throughout the service period.

Participation in the KASC RDC activity is initiated by an agreement between a company and the University of Pittsburgh. This step is usually (but not always) achieved by the marketing activity. Marketing then issues a memorandum to Dr. Holzman informing him of the new addition to the system and requesting appropriate action be taken to phrase the company's interest profiles. A copy of this memo is sent to the respective managers of the Operations and Analysis groups alerting them to initiate set-up operations.

Upon receipt of the 'initiation' memo, Dr. Holzman will contact the new client for a general background or orientation session. This is normally a telecon terminating in a request for a list, in natural language, of the Company's interest areas. The preliminary list (or the telecon itself) is used as a basis for determining the technical disciplines involved in the Company's interest areas and assigning technical specialists to service individual profiles.

When the consultants are assigned, a personal meeting is arranged with technically competent personnel of the new Company. The purpose of this meeting is to achieve a thorough understanding of the Company's needs and to properly phrase its interest profiles.

The Pitt consultants will then meet with the KASC analysis group to prepare computer search strategies for the respective profiles. A computer search will be performed to identify literature relevant to each profile. For each pertinent citation identified, an abstract will be forwarded to the respective Pitt consultant for review. The consultant's objective is to eliminate as much system 'noise' as possible and to insure that only citations relevant to the customer's

needs are forwarded.

In addition to their 'reviewing' activities, the consultants are in frequent contact with their industrial counterparts in an effort to facilitate successful exploitation of the identified literature.

ANALYSIS SECTION

The function of the analysis group is to successfully exploit the technical content of the RDC files to the benefit of the participating clients. In implementing this function, the group relies heavily on the engineering personnel who provide subject expertise necessary to understand the participants' needs and who act as consultants in a limited capacity related to the technical contents of identified citations and their application to the clients' needs.

The section comprises four full-time and six part-time personnel and is on a subject area basis. These personnel are all subject specialists who are technically competent in their own right. In fact, there are only three major factors which differentiate the analysis group from the engineering consultant group: (1) the consultants have more in-depth subject expertise than the analysts; (2) analysts perform searches--engineers do not; (3) the analysis group is a line unit of the KAS Center--the consultant group is a functional unit of KASC.

The subject area organization of the section permits the assignment of two analysts in each of six broad subject areas. Assignments are made on the basis of the complexity of the profile and the specific subject strength of the analyst.

The current organization of the section is as follows:

Physics:
- W. Poley
- C. Mellott
- S. Majundar

Engineering (Mechanical, Industrial, Materials):
- E. Hartner
- W. Poley
- B. El-Hadidy

Psychology and Management Science:
- E. Poley
- M. de Korvin

Chemical Engineering:
- E. Phillips
- B. El-Hadidy

Chemistry:
- E. Hartner
- L. El-Hadidy
- M. de Korvin
- B. Ely

Biological Science:
- L. El-Hadidy
- M. de Korvin

The analysts, like the consultants, are assigned on the basis of their subject specialties. In serving KASC clients, each analyst may be called upon to perform any or all of the following functions of the analysis section:

- Phrase interest profiles
- Formulate computer search strategies (Boolean)
- Perform manual searches
- Review search results
- Prepare sample search brochures for marketing
- Process monthly tapes for reformatting and search
- Maintain liaison with clients and engineering consultants

Brief resumes of the analysts are to be found in Appendix A.

MARKETING

The primary mission of the marketing activity is to induce industrial concerns to exploit the NASA files at KASC on a fee-paying basis--the ultimate goal being self-sufficiency of the RDC.

Approach

The marketing philosophy is to concentrate on industrial concerns whose interest areas and product lines are judged most amenable to utilization of the technical content of the NASA files--either directly or indirectly.

No discrimination is made on the basis of size or financial factors. However, experience has shown more marketing success with companies possessing the technical competence to assimilate the sophisticated data comprised by the NASA files.

Personnel

Two full-time personnel are assigned to the marketing activity. The manager is responsible for planning and controlling the overall marketing activity. His secretary, above and beyond the normal secretarial function, is responsible for implementation of the direct mail effort to be discussed later.

Although only two personnel are assigned full-time to marketing activities, the Director and Assistant Director of KASC are very active in making presentations, and engineering personnel are utilized frequently at group presentations and to make personal presentations when it is appropriate.

In addition, all secretarial personnel of the Center participate in the direct mail program of the Marketing Section.

Tools

The primary marketing tools used at KASC are direct mail advertising in combination with personal presentations. In addition, KASC has utilized group presentations, newspaper advertising, and journal articles. During the coming year, a concerted effort will be made to use the personal contact route to increase utilization by existing participants.

Statistics reflecting the scope of utility of each of these tools are as follows:

Type	January 1967 through February 1968
Direct Mail	3760
Personal Presentations	140
Group Presentations	31
Advertising	1
Periodic Contact	-
Journal Articles	1

Direct Mail

Three separate letters have been prepared for the mail program which is based on mailings to industrial companies identified through the use of industrial directories. These letters are identified as: the Initial Letter; the First Follow-Up Letter; and the Second Follow-up Letter. (A copy of each of these letters is to be found in Appendix B.)

Each week approximately fifty initial letters are mailed out. If

no response is received within 30 days, the first follow-up letter is mailed. Again, if no response is received within a 30-day period, the second follow-up letter is sent. If this last letter does not elicit a response, the company name is removed from the mailing list.

The following statistics reflect the scope of the direct mail program and its results during the reporting period:

Type	Total Mailed	Positive Resp.	%	Negative Resp.	%	Total Resp.	%
Initial	2334	117	5.0	57	2.4	174	7.4
First Follow-Up	882	45	5.1	21	2.4	66	7.5
Second Follow-Up	544	22	4.0	17	3.1	39	7.2
Total	3760	184	4.9	95	2.5	279	7.4

Personal Presentations

The positive responses elicited from the direct mail program are followed up by telephone and/or mail contact. Usually, the first effort is by telecon with two primary objectives: (1) determination of our potential to benefit the prospective participant; and (2) determination of the degree of interest.

If there is considerable interest and little potential, our evaluation is expressed frankly and little effort is made to set up a personal presentation meeting. If there is considerable potential and little interest, a concerted mail and telecon effort is made to set up a personal meeting. If there is both potential and interest, a personal meeting follows almost naturally with little or no effort

required.

The presentation meeting is normally with an executive officer of the company. More frequently than not, there are two or three interested parties at the meeting. Also, quite frequently but not as a rule, if the company has a technical librarian, he/she is in attendance.

If a librarian is in attendance, it behooves the marketing man to (1) get the librarian on his side; (2) know the librarian's problems and emphasize how the service will supplement--not supplant--his/her efforts; (3) not to oversell the NASA data file itself.

The presentation itself comprises an explanation of NASA's Technology Utilization objectives, the role of the RDC in general, and the method of operation of KASC in particular. Considerable emphasis is placed on the relationship between KASC and the School of Engineering, and of the technical competence available to participants of the KASC operation.

A technique used and found particularly effective is to prepare for the presentation a brochure slanted towards the Company's interest area. This brochure is a simple folder which opens to reveal two pockets containing literature.

The left pocket contains two pamphlets, one describing KASC and the other describing the NASA program. These two documents are seldom passed out during the presentation--they are intended as post-visit reminders.

The right pocket contains:

1. A list of company participants at KASC.
2. A list of the scope of the file (a Xerox copy of the front matter from STAR or IAA).
3. A list of subject areas currently being searched at KASC.
4. Results of a sample search of an interest profile reflecting a general (sometimes specific) interest of the company.
5. A fee schedule.
6. Two copies of an agreement form.

With the exception of Item No. 6, the others are all used during the presentation. The technique of presentation will vary, depending on the size and make-up of the group. In the main, however, KASC personnel are taught to use the following technique:

1. Ask the company representatives to talk about their organization's mission and their respective roles, responsibilities and interests.
2. Identify the decision makers.
3. Note potential subject areas for later discussion. The subject areas noted should not exclude 'negative' ones. These must be discussed overtly.
4. Discuss NASA's overall mission in general and its T/U effort in particular.
5. Identify the various RDC's and their geographic locations.
6. Identify common input and individual output operations.
7. Take the group on a step-by-step tour of the service procedure from phrasing of the profile to submitted hard copy documents. In this 'tour' use prepared:

a. Strategy sheet
b. IBM card
c. Computer print-out
d. Unscreened abstracts
e. Transmittal sheet
f. Screened abstracts
g. Microfiche
h. Hard-copy document

8. Identify sample search prepared, discuss limitations of sample search (lack of technical liaison, etc.), then pass out results.

9. Open discussion period.

10. Close.

Group Presentations

This type of presentation is most often given at a professional society meeting or conference. It can be an industrial conference, a chamber of commerce meeting, or an academic event. Whatever the occasion, its value as a marketing tool cannot be assessed in quantitative terms and can only be surmised in qualitative terms.

One factor can be stressed--the speaker must be knowledgeable in technology transfer techniques and problems, in the scope and content of the file, and in ways and means by which the file can be exploited.

Advertising and Journal Articles

KASC has tried both these techniques with no success. A journal article on the Center's activities was prepared by the University's Public Relations Department and published in the Pittsburgh Chamber of Commerce Publication. Not a single response was elicited.

Advertising in a local paper met with similar results--no response.

KASC tried both these methods on a one-time basis. Under the circumstances, no conclusion can be reached as to the merits of either of these two marketing tools for RDC activities.

Periodic Contacts

The periodic contact approach to 'sell' increased service has not been used at KASC during the reporting period. Until recently, this approach has been used only for contract renewal efforts.

KASC Client Membership

The reporting period covers all of 1967 plus two months of 1968. At the close of the reporting period, KASC had 61 active participants on an annual basis. This number is broken down as follows:

New Clients	27
Renewals	34

A historical summary of KASC membership by year from April, 1964, through February, 1968, is shown in Figure 4-2.

Client Composition

Client composition is shown geographically in Figure 4-3, by size and type in Figures 4-4 and 4-5, and by Standard Industrial Classification Code in Figure 4-6.

Industrial Income

The total industrial income for the reporting period is best shown graphically in Figure 4-7. Derivation of the income figures is based on the total contract value divided by the timespan of service

TYPE	1964	1965	1966	1967	1968+
New	10	35	25	19	8
Renewal	--	8	23	34	3
One-Time Contracts	--	1	3	7	2
Dropouts	--	2	14	19	1
In Process	--	--	6*	2*	50**
TOTAL SERVED	10	46	71	81	64

* Contract period expired but service continued during negotiations.

** Companies whose contracts are overlapping from the previous year and are not yet up for renewal.

\+ First two months only.

Figure 4-2. KASC RDC Membership, 1964-1968

	1964	1965	1966	1967	1968*
Connecticut			1	3	2
Delaware					1
Maryland			2	3	4
Massachusetts		1	3	2	
Michigan		1	1	1	1
Missouri				1	
New Hampshire				1	
New Jersey		1	5	7	7
New York			2	5	5
Ohio		5	6	9	8
Pennsylvania	9	37	51	48	36
Texas				1	
West Virginia	1	1			
TOTALS	10	46	71	81	64

* First two months only.

Figure 4-3. Client Composition - Geographic

	1964	1965	1966	1967	1968
Large	10	30	47	53	46
Small*	--	16	24	28	18
TOTALS	10	46	71	81	64

* Under 1000 employees

Figure 4-4. Client Composition - Size

	1964	1965	1966	1967	1968
Manufacturing	9	43	68	71	56
Research and Development	1	3	3	9	7
Non-Industrial	--	--	--	1	1
TOTALS	10	46	71	81	64

Figure 4-5. Client Composition - Type

CODE NO.	CATEGORY	1964	1965	1966	1967	1968
13	Petroleum, Gas Products				1	1
16	Construction (Non-Building)	1	1	1	1	
26	Paper and Allied Products					1
27	Printing, Publishing				1	2
28	Chemical Products		4	7	7	7
30	Rubber, Plastic Products		1	3	3	2
32	Stone, Clay, Glass Products	1	1	2	2	1
33	Primary Metal Industries	6	18	17	15	16
34	Fabricated Metal Products		1	8	8	3
35	Machinery (Non-Electric)		5	8	5	6
36	Machinery (Electric)	1	12	16	19	15
37	Transportation Equipment			1	2	1
38	Instruments (Photo, Optical)		1	5	6	4
73	Research (Commercial)	1	2	3	6	4
89	Research (Non-Profit)				2	
91	Federal Government				1	1
	TOTALS	10	46	71	81	64

Figure 4-6. Client Composition - SIC Code

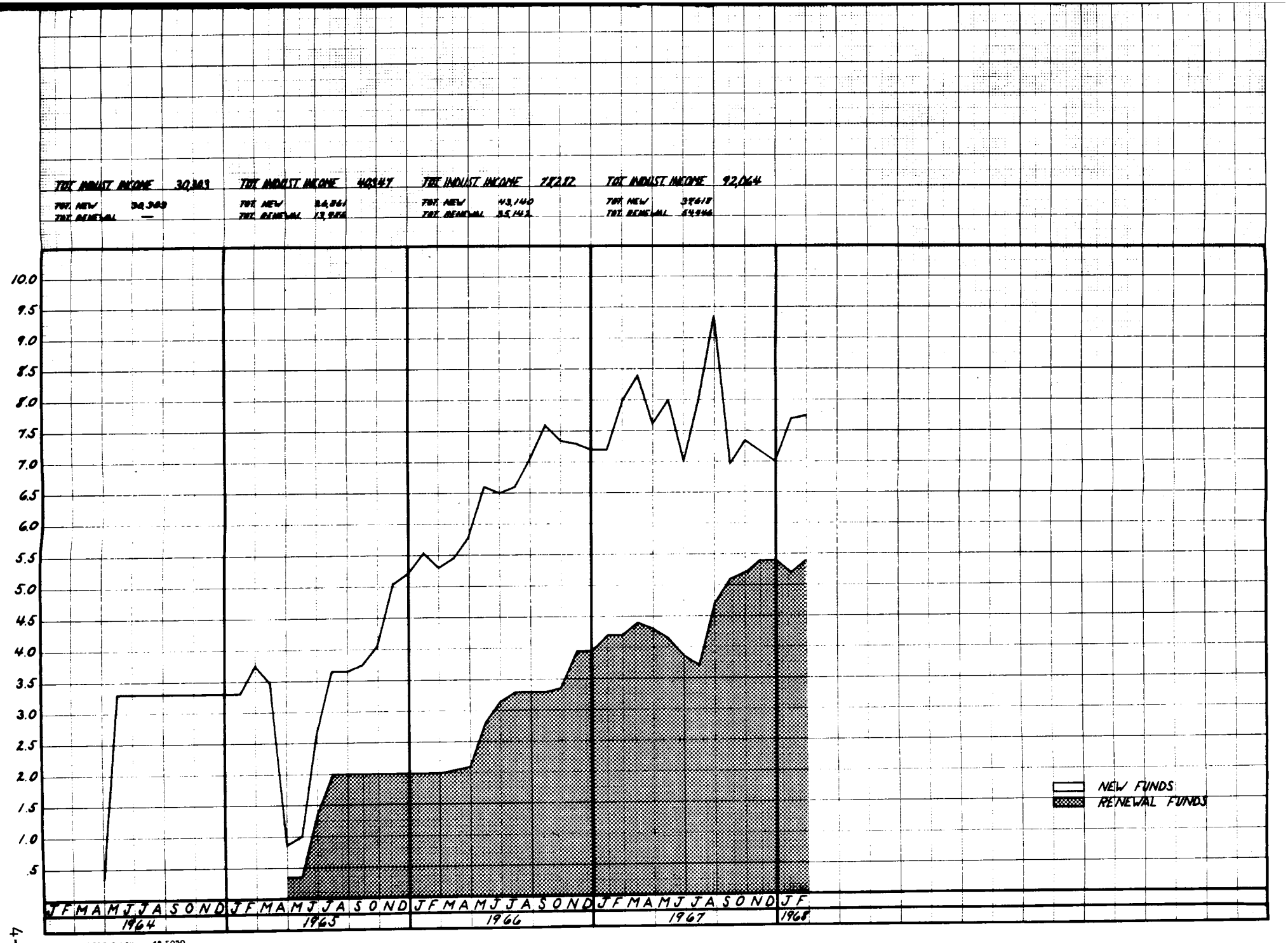

Figure 4-7. KASC RDC Industrial Income

(annual clients--12 months, one-time clients--one month). Income was then calculated as beginning with the first search period. For example: An annual-basis company with a contract value of $1200 had its first search in July, 1967. Income to KASC for 1967 is considered as $600. The remaining $600 is considered as 1968 income.

TECHNICAL OPERATIONS

The operations group has as its main mission the timely processing through the system of any and all requests from receipt of the initial inquiry for profile phrasing through delivery of requested documents. In addition, this group is responsible for maintaining records on a per unit basis of all services rendered to each participant who exploits the files.

The group comprises a total of 13 employees of which only the supervisor is a professional. The other 12 personnel are all clerical or secretarial types and include eight full-time and four part-time employees.

Services

KASC provides two basic services: current awareness searches and retrospective searches. However, because they are offered in combination, we refer to three basic service elements as being available at KASC:

1. Current awareness service.
2. Retrospective service.
3. Current awareness and retrospective service in combination.

Current Awareness Service

This service is initiated with a search of the first tape received from NASA/Washington after the participant has formally requested service of KASC. The normal service period comprises a search of each of 12 consecutive monthly tapes.

Retrospective Service

The retrospective search exploits the files backwards in time. Its objective is to identify all documents in the file which are relevant to the requestor's interest profile.

The NASA tapes covering the period of 1962 through 1967 have been reformatted at KASC and comprise four tapes, two of which cover the period 1962 through 1965 and the other two of which cover the years 1966 and 1967. These tapes require strategies using the index terms in the NASA Subject Authority List (SAL).

The 1968 period saw the beginning of indexing using the NASA Thesaurus. Accordingly, a new set of retrospective tapes is being used for accessions beginning with the search period 1/68. Thus, a retrospective search, to be complete, will require a search with SAL strategies for the period 1962 through 1967 and a search utilizing a 'Thesaurus' strategy for the 1968 and on period.

Current Awareness Plus Retrospective Service

This service is simply the combination of both types of searches applied to a single customer profile. Service may be initiated by a partial retrospective (to test the search strategy) or by an

initial C/A (also to test the strategy) before performing a complete retrospective and continuing on a C/A basis.

Scope of Service

Unique Profiles

During the reporting period, the Operations group serviced 91* individual organizations (See Figure 4-8) by processing, controlling and recording the results of both current awareness and retrospective searches of 1481 unique profiles:

• Current Awareness Profiles	968
• Retrospective Profiles	163
• Combination of Both	350
TOTAL	1481

The above figures reflect individual profiles as differentiated from profile 'searches.' A profile searched only on a current awareness basis may be searched 12 times--thus 12 searches--but it is still only one (unique) profile. A profile searched on a retrospective basis is considered as having been searched only once. A profile which receives both retrospective and current awareness searches is considered as having been searched 13 times--for a full year's service.

Figure 4-9 shows a curve of current awareness service per search period during 1967 and early 1968. Search Period No. 13 represents the last tape having NASA accessions indexed on the basis of the NASA Subject Authority List (SAL).

* Eighty-one in 1967 and 10 new companies in the first two months of 1968.

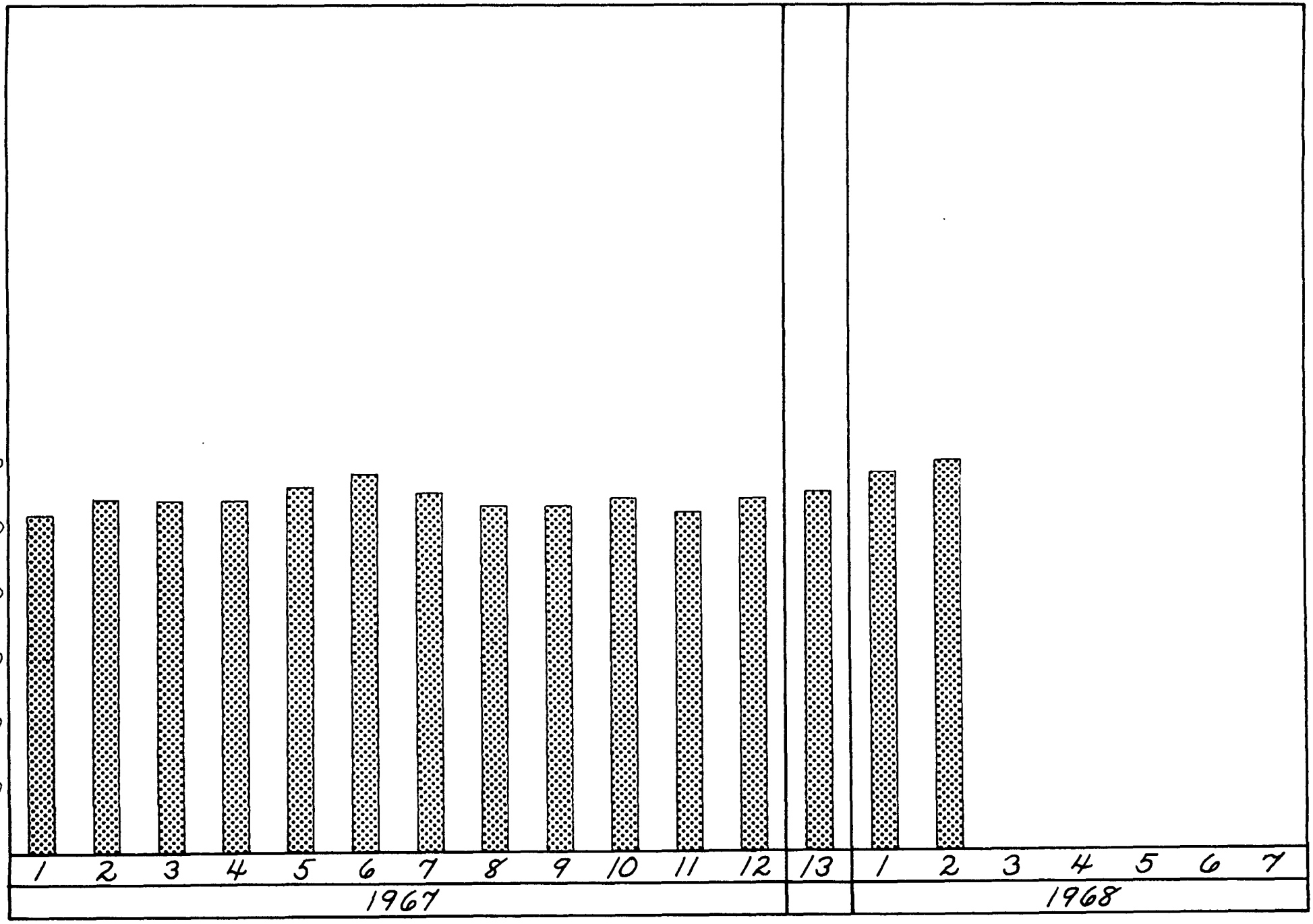

Figure 4-8. Companies Served Per Search Period

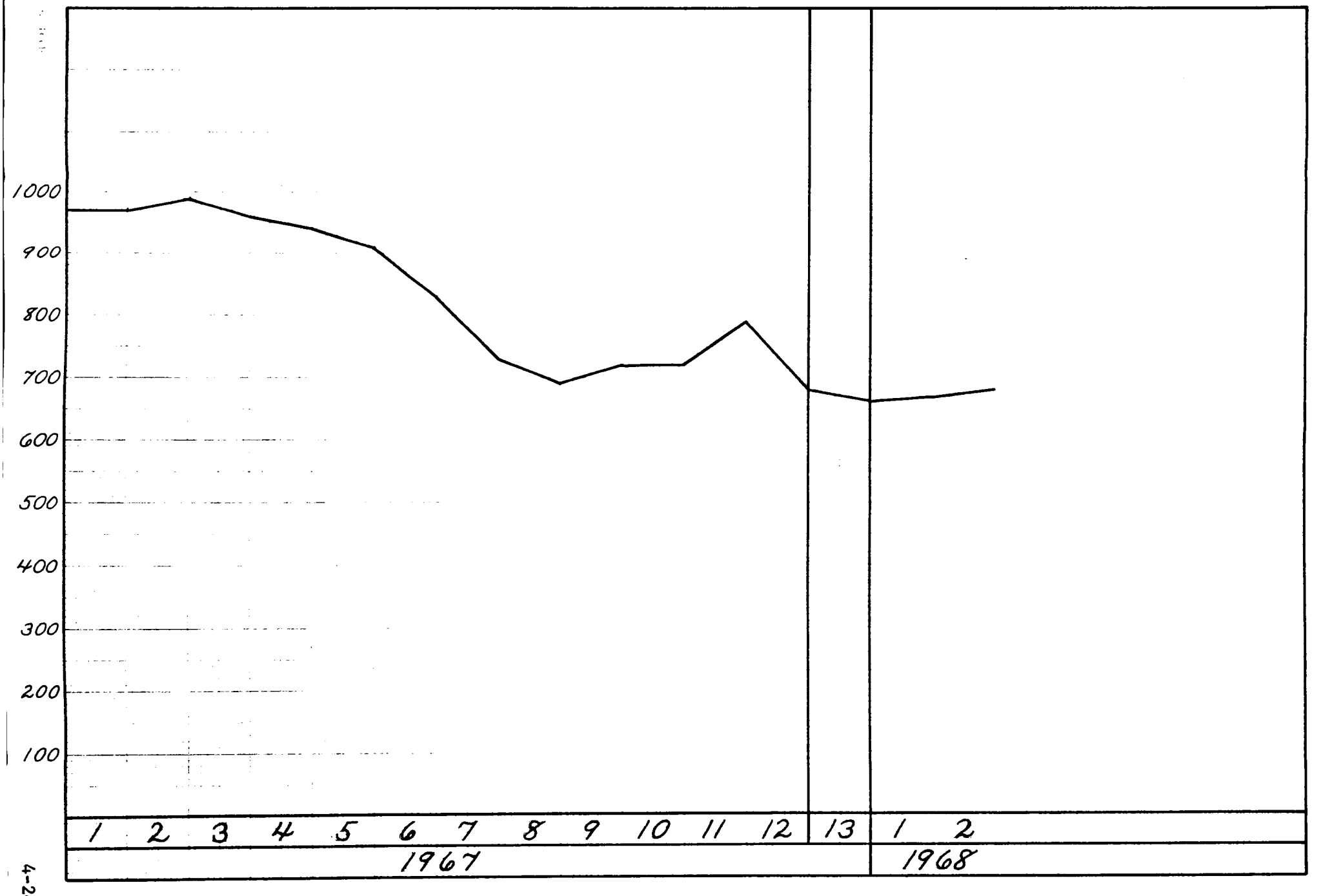

Figure 4-9. Current Awareness Profiles/Month

As indicated previously, KASC's reformatting program has compressed the NASA retrospective files (about 18 tapes) down to four KASC tapes. Two tapes cover the period 1962 through 1965, and the remaining two tapes cover the period 1966 and 1967. In addition, a separate tape has been started for the 1968 accessions indexed on the basis of the NASA Thesaurus.

Thus, a retrospective 'search' to cover the entire file requires one run using SAL strategies for the period 1962 through 1965; another run also with SAL strategies for the period 1966 through 1967; and a third run using 'Thesaurus' strategies for the period 1968 and on.

Because of the nature of the KASC retrospective file, a complete retrospective is seldom performed 'all at once.' Normally, the 1966-1968 period is searched first. (The 1966-1967 tape is searched mechanically; the 1968 file is searched manually.) The output of this 'partial' search is submitted to the participant with a note indicating that the retrospective search is incomplete and, if he desires, he may request that the remaining portion of the file be searched. The standard KASC fees include charges for total retrospectives--none for partial retrospectives. Therefore, there is no additional charge for the 'second' portion of the retrospective.

Figure 4-10 shows the number of unique retrospective profiles compared against the number of 'searches' performed. For example, in May, 1967, KASC performed retrospective searches of 47 unique profiles (the shaded portion). However, in the same month our personnel performed 72 retrospective 'searches.' These 72 searches

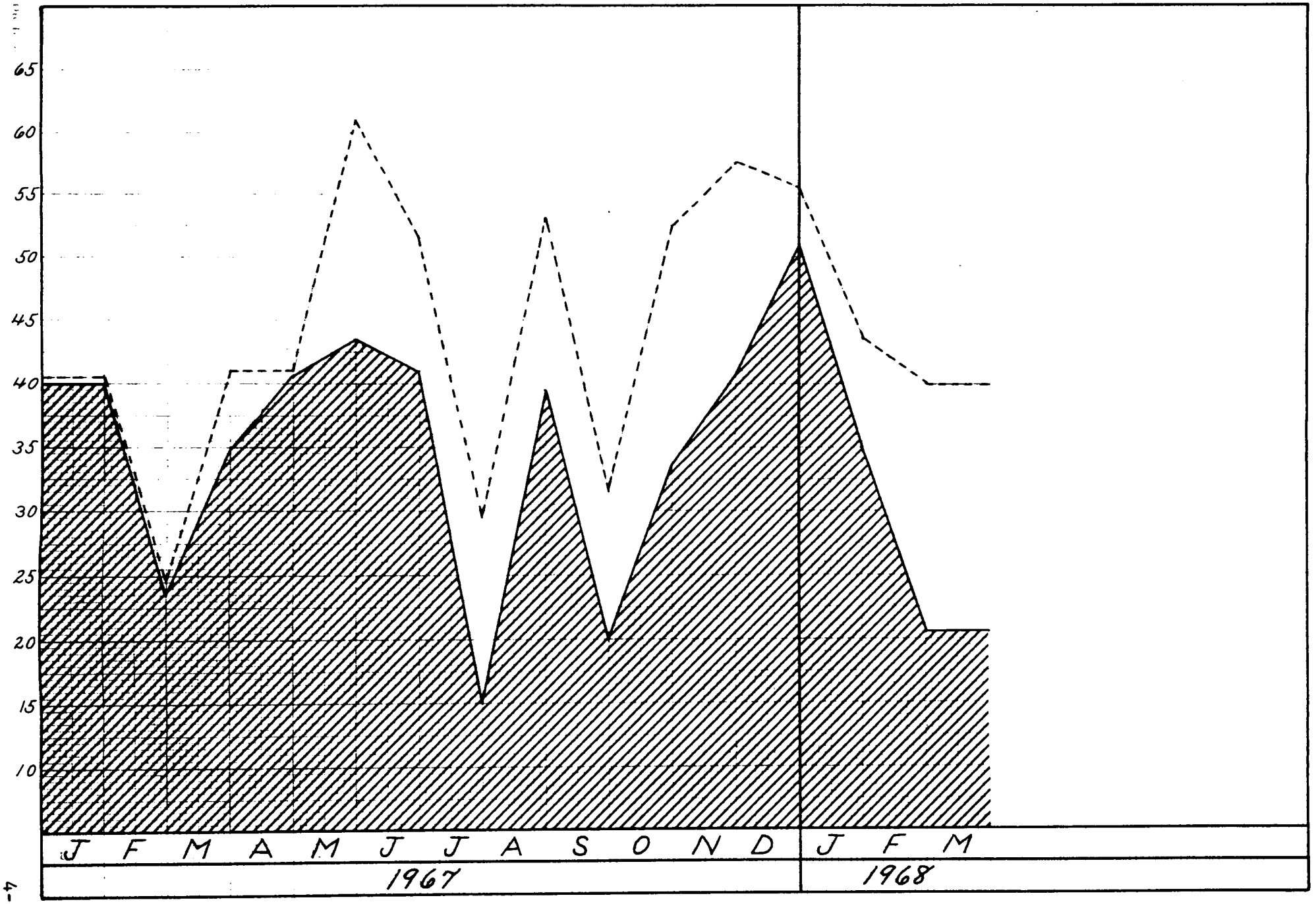

Figure 4-10. Retrospective Profiles (Unique vs Searched)

included the 'second' half of retrospective profiles searched previously for only the 1966 through 1968 portion of the file.

The illustration appears to indicate that customer 'satisfaction' is achieved with less than a complete retrospective. However, this generalization is not a safe one to make, and we simply note that this area requires more in-depth study.

Profile Searches

A total of 12,474 current awareness and retrospective searches were performed during the reporting period.

• Current Awareness	11,961
• Retrospective	513
TOTAL	12,474

Of this total, 2863 searches resulted in 'no citation' reports and are divided as follows:

• Current Awareness	2,859
• Retrospective	4
TOTAL	2,863

This figure of 2863 is 23% of the total searches performed and is worthy of some discussion.

A 'no citation' report, in reality, is a 'no relevant citation' report. An output of zero citations is self-explanatory--no citations. However, any profile which has output that is deemed completely non-relevant is also considered a 'no citation' profile.

Figure 4-11 indicates that there are approximately 200 profiles per search period associated with the 'no citation' tag. These 200 profiles are not, however, the same profiles each search period. Some may be repeats but the others are 'new' ones for which there is no citation during that particular period.

A 'no citation' tag can result from three possible causes:

1. The phrased profile may be extremely narrow and specific.
2. Abstract journal coverage of subject areas may be cyclic in nature.
3. Search strategies may be inadequate.

The narrow, specific question is the main basis for selective dissemination of information--our quality service. If the service we render is successful in identifying information of specific interest and is of immediate value to the client, we have provided a most valuable service.

The yield, relevant to a specific interest, can be as low as one paper a year, or as much as 20 or 30 citations per month. If considerable research is being performed in a subject area, such as the current interest in electrical behavior in the solid state, the number of items published will probably be high. On the other hand, if the subject area is being investigated by only a few, the yield will be small. However, it will still be of vital interest to those few men, and their 'profile' may have only few positive results and many 'no citation' results.

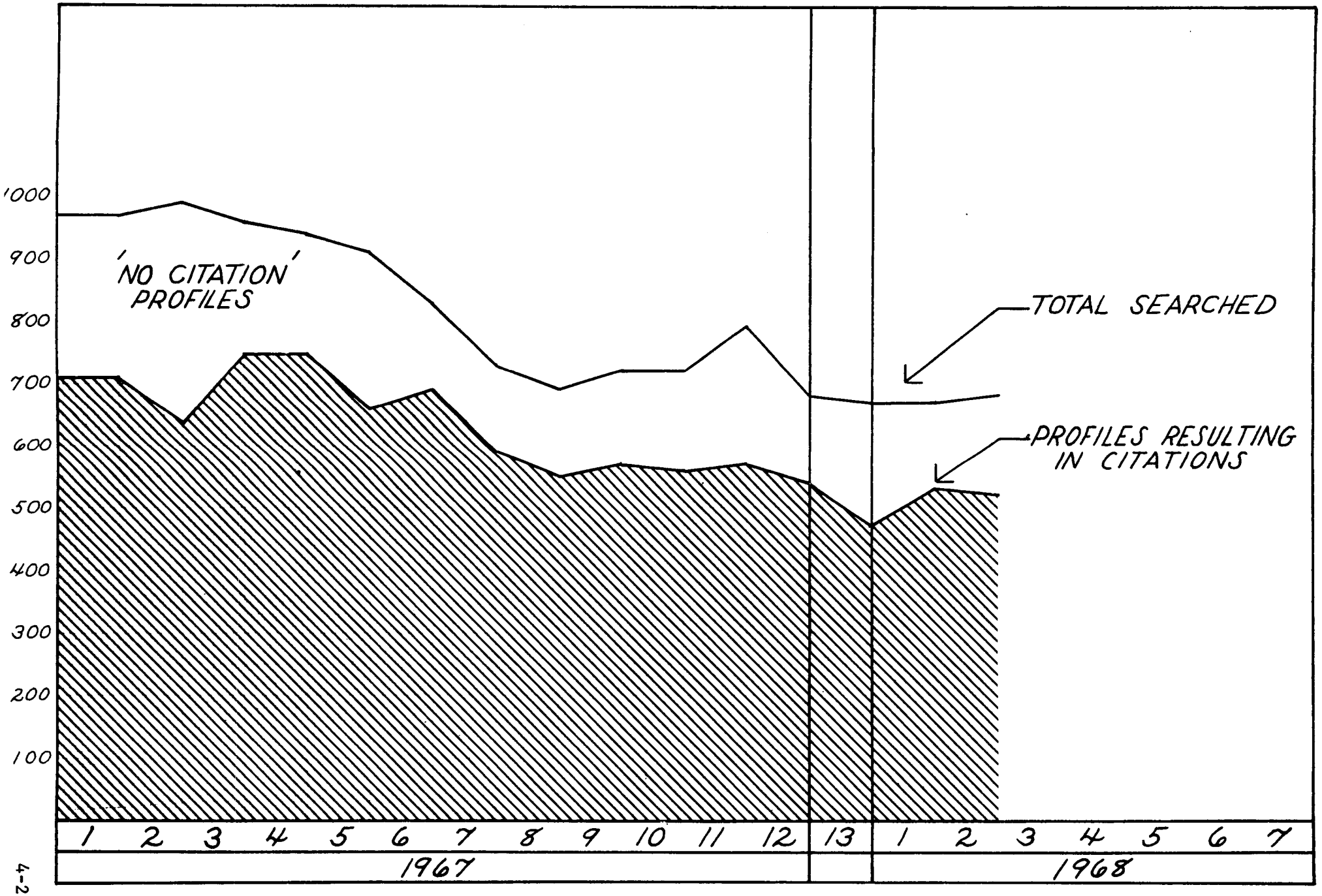

Figure 4-11. Profiles Resulting in No Citations

Poor yield may result also from searching a field not previously investigated. Here a negative result is expected and sometimes even desired by users as confirmation of limited research in the particular subject area.

Another possible reason for 'no citations' is the cyclic fluctuation in subject matter coverage by abstract journals. For example, the Transactions of the American Society for Metals is a quarterly publication--as are many other technical publications. The Transactions . . ., most probably, are covered by the abstract service only four times a year. This means that in our program, four search periods of any one year may be very productive with materials in the metals field, and the remaining eight periods may yield very poor results.

Another factor contributing to cyclic coverage is the phenomenon of conferences (we can readily add seminars and colloquiums). Abstract coverage for these events probably appears in a single journal issue. The occurrence, for example, of a seminar on 'Stress Corrosion' can result in one issue of an abstract journal having 50 to 100 abstracts. The remaining issues may have little or no abstracts on the subject.

A third possible reason for 'no citation' reports is an inadequate strategy. The KASC system frequently operates on the basis of testing a strategy on a current awareness basis before running it for a retrospective search. Thus, a first strategy may be inadequate and pull 'no citations.'

Preventive action procedures for inadequate strategies is part of the KASC systems. Every 'no citation' search is subjected to a

manual search of the literature. If relevant literature is identified, the index terms used for that item are investigated and used to modify the profile strategy.

An inadequate strategy can result from incomplete coverage of applicable terminology in the search statement, lack of understanding of the requestor's needs on the part of the person preparing the strategy, or poor indexing of the accessioned item.

A major factor contributing to inadequate indexing is the time lag between the creation and the adoption of a newly formulated technical term. Such a term may arise from the discovery of a new material or its behavior under certain environmental conditions. The term becomes part of the knowledgeable 'patter' in a subject area. Everybody wants to know about it, but we do not have a tool to pull it out. A typical example of such a term is 'superplasticity.'

These three factors, narrowly phrased profiles, cyclic subject matter coverage, and inadequate strategies, are the major reasons for the 23% 'no citation' results obtained during the reporting period. A very brief, and in no way comprehensive, sampling of these profiles indicates that approximately 75% are of the 'narrow phrasing' type and that the clients want them that way. However, the need for a more thorough analysis in this area is indicated.

Citations Retrieved

The 12,474 current awareness and retrospective searches performed during the reporting period resulted in the retrieval of 427,739 citations of the following types:

- STAR and IAA 422,473
- Tech Briefs (manual searches) 466
- Aerospace Medicine and Miscellaneous 4,800

TOTAL 427,739

Citations Forwarded to Clients (See Figure 4-12)

After subject specialist review, a total of 119,166 citations were deemed relevant to individual profiles and submitted for customer evaluation. The breakdown by type is as follows:

- STAR and IAA 116,499
- Tech Briefs 458
- Aerospace Medicine and Miscellaneous 2,209

TOTAL 119,166

Here is another interesting area requiring considerable in-depth analysis. The above figures indicate that of the total citations retrieved, only 27.8% were forwarded, i.e., found relevant. On the basis of types of citations, the percent of 'relevancy' is as follows:

- STAR and IAA 27.5%
- Tech Briefs 98.2%
- Aerospace Medicine and Miscellaneous 46.0%

However, it is not the degree of relevancy that is the interesting factor here--it is the other side of the coin--the 72.2% that is found non-relevant.

At KASC, every citation identified, either by computer or by manual

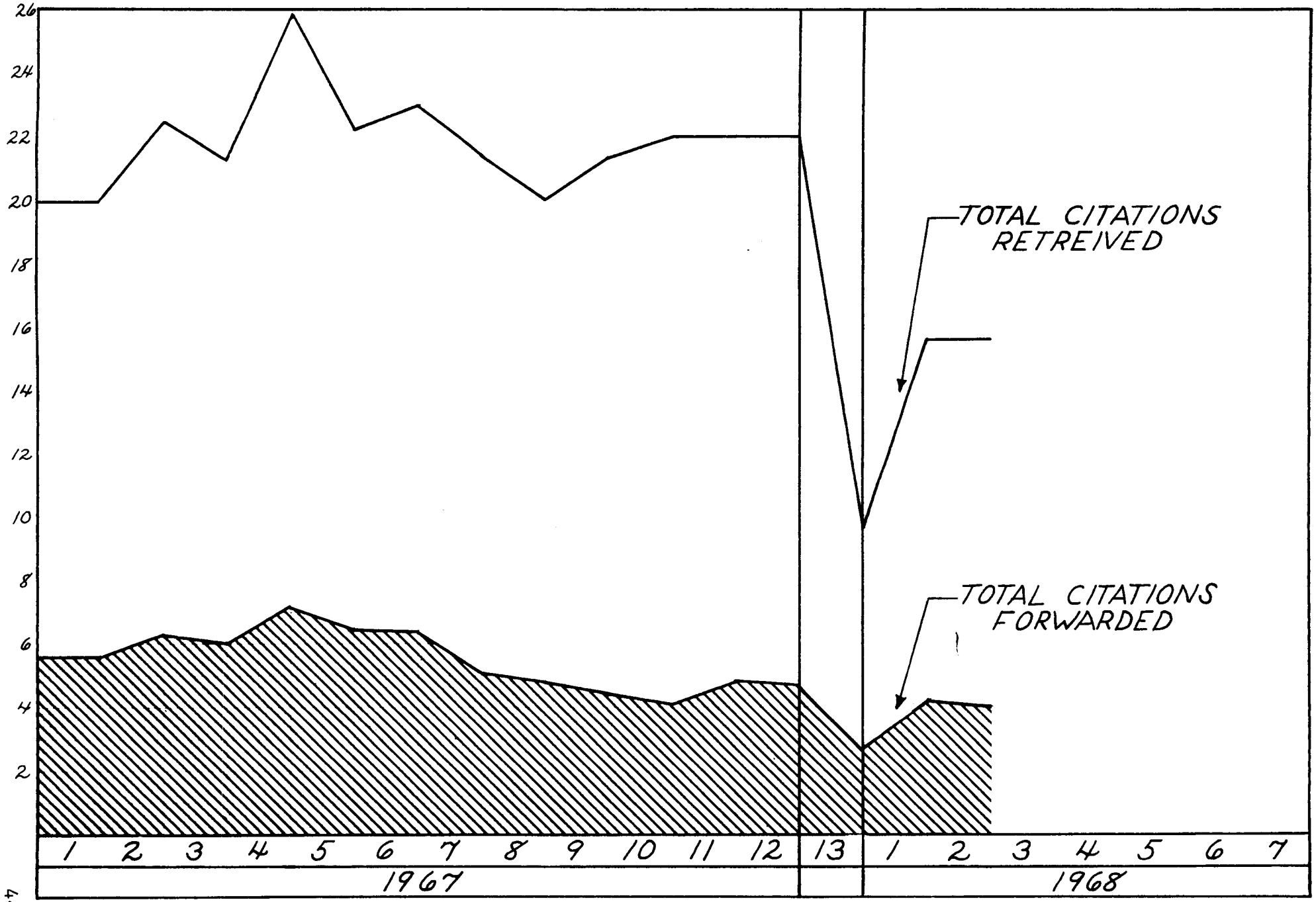

Figure 4-12. Citations Retrieved vs Citations Forwarded

search, triggers the pulling of an abstract card from a master file and duplicating it for processing and review. The duplication is performed on a Bruning machine. Thus, excluding Tech Briefs, 427,273 abstracts were pulled and duplicated, and of this total 308,567 abstracts were processed and discarded.

A conservative estimate of $.025 cents per abstract for material costs and machine time applied against the number of abstracts discarded results in a significant figure of $7,899. If clerical time for processing (retrieval, duplication, verification, etc.) were added, the direct labor and materials cost together would be $25,673. Add computer costs and professional time for review (again, excluding overhead), the figure would rise to $74,028. And, finally, inclusion of the overhead factor would increase the cost figure to the general area of $89,238--approximately 37% of the operating budget of the program.

These figures are expressed only to stress an area worthy of considerable in-depth analysis. We hasten to point out that our preliminary studies have not identified alternate approaches which would yield substantial cost reductions (while still maintaining quality service) except for eliminating the use of abstracts--a feature we consider most important.

Customer Evaluation of KASC Search Results

We would like to report that KASC participants returned an evaluation sheet for each search result submitted. We can't. Our statistics indicate a 64% return factor. Out of a total of 12,474 searches performed, there were 2,863 'no citation' results. Thus,

our clients could have evaluated only 9611--if there were a 100% return. In fact, only 6131 evaluations were received. The 64% figure is based on actual returns from the total of 9611 possible returns (See Figure 4-13).

In terms of citations evaluated, the figures are as follows:

	Citations Submitted	Citations Evaluated	% of Total Submitted
STAR and IAA	116,499	66,275	56.8
Tech Briefs	458	133	29.0
AM and Misc.	2,209	571	25.8
	119,166	66,979	56.2

A study of the customer-evaluated citations indicates that of the totals evaluated by him, he found 70.5% relevant to his profiles, 19.5% non-relevant, and 10% relevant to other interest areas. By citation types, the breakdown is shown in Figure 4-14.

DOCUMENT SERVICE

The document production group is composed of seven personnel, five of whom are full-time employees and two of whom are part-time employees. This complement of personnel uses an Itek 18-24 microfiche reader/printer to prepare hard copy from microfiche, and a Xerox 2400 for electrostatic reproduction of original documents--mostly A-documents.

During the reporting period, KASC furnished its participants in the RDC activity with both N-document and A-document service. N-documents were prepared either in-house or sent to us from NASA/Washington.

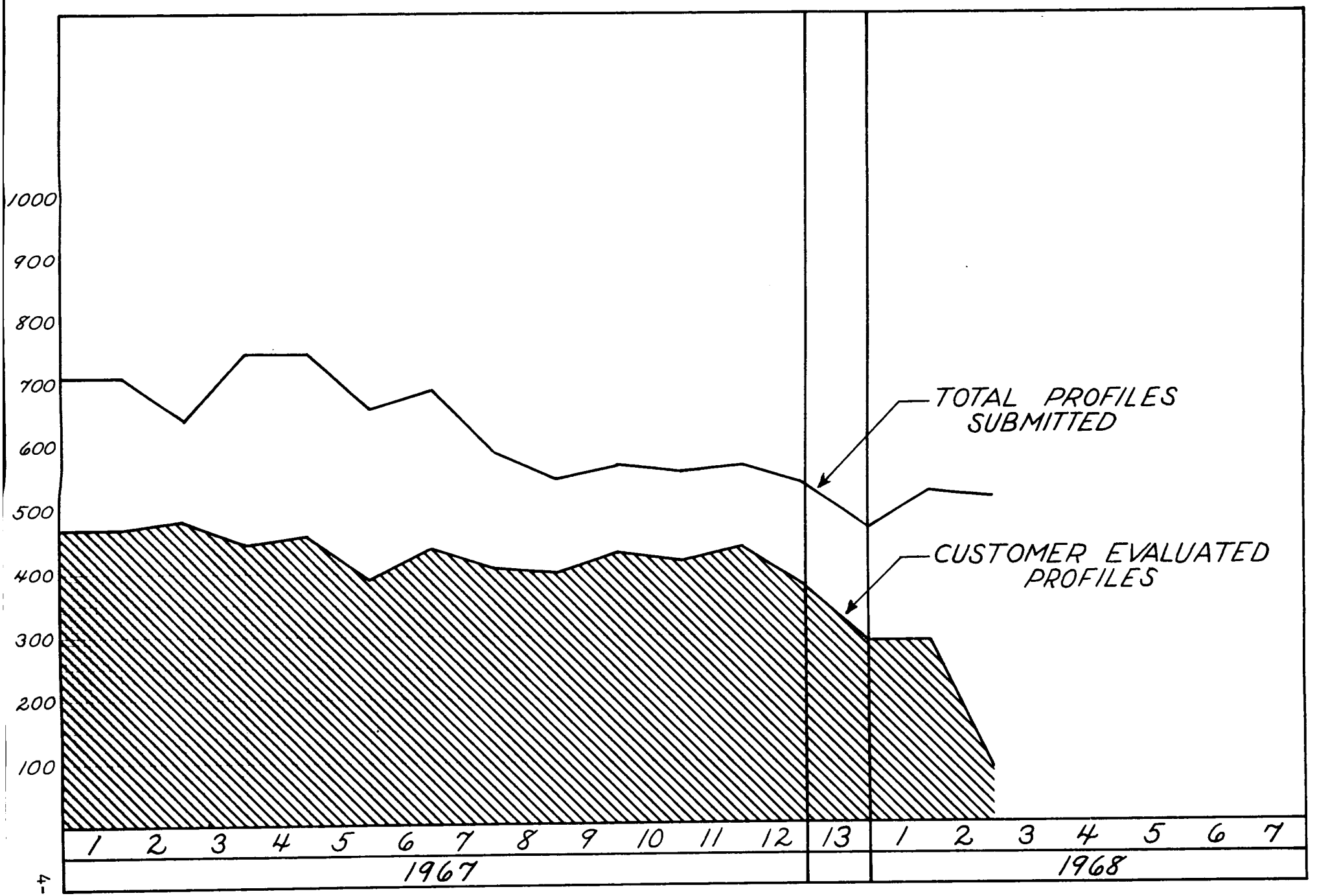

Figure 4-13. Customer Evaluated Profiles

TYPE	RELEVANT	%	NON-RELEVANT	%	RELATED TO OTHER INTERESTS	%
STAR and IAA	46,702	70.4	12,961	19.5	6,612	9.9
Tech Briefs	100	75.1	23	17.2	10	7.5
AM and Misc.	431	75.4	105	18.3	35	6.1
TOTALS	47,233	70.5	13,089	19.5	6,657	9.9

Figure 4-14. Customer Evaluation of Citations

A-documents were ordered from the American Institute of Aeronautics and Astronautics (AIAA).

Effective January 1, 1968, NASA hardcopy service to KASC was restricted only to those copies which are not on microfiche. A-document service is still available from AIAA. However, KASC has established a system whereby local library resources are being exploited to minimize delivery time as well as the extent of service from AIAA.

For each document request received, a document handling form (Figure 4-15) is prepared in order to insure control throughout the entire cycle. This form is prepared regardless of whether the document is an 'in-house' document, a STIF document, or a TIS document.

The five full-time employees prepared handling forms, duplicated microfiche and processed the material through the Center. One of the part-time employees comes in three times a week to Xerox AIAA documents. The other part-time employee works in the evening reproducing microfiche.

Scope of Service

During the service period, documents furnished by KASC to its participating clients were prepared either at STIF, TIS or KASC itself. Thus, the statistics which follow must not be interpreted as 'in-house' service.

From the first search period of 1967 (1/67) through the second search period of 1968, KASC processed 20,168 documents as follows:

PITT-1112 (REV. 3/67)

£

KNOWLEDGE AVAILABILITY SYSTEMS CENTER
UNIVERSITY OF PITTSBURGH
PITTSBURGH, PA. 15213

A68-14211
DOCUMENT

Requested by:

Mr. David L. Jones
D. L. Jones Company, Inc.
100 First Avenue
Pittsburgh, Pennsylvania

For : Question 11257 , Search Period 2-68

Other

DAY IN	REPR.	T.I.S.	S.T.I.F.		DAY OUT	MAIL TO
5/15/68 230		5/23/68				Requestor / Other

Figure 4-15. Document Handling Form

• N-documents		10,789
• A-documents		9,379
	TOTAL	20,168

N-documents average 47.5 pages per document and A-documents average 13.4 pages per document. On the basis of these figures, KASC furnished its clients with the following number of pages:

• N-documents		512,478
• A-documents		125,679
	TOTAL	638,157

On a citation basis, the statistics indicate that of 119,166 citations submitted, 32% resulted in document requests. On a per unique profile basis, 13.6 documents were ordered per profile.

Figure 4-16 reflects a comparatively accurate picture of the extent of service provided clients during the period September, 1965, through March, 1968. This illustration reflects documents submitted during a particular month, any one of which may have been ordered weeks earlier. Thus, a correlation cannot be made (using this illustration) between search period and document delivery period.

RDC IMPACT

Until very recently, KASC efforts to document successful application of technology identified by the NASA RDC activities at the University of Pittsburgh were centered on the identification of transfers--in the narrow sense of the word. The introduction of the phrase 'impact reporting', at least at the operating level, was simply the exchange of one synonym for another. To the person attempting to document 'impact' or 'transfer', these terms meant evidence of utilization of space technology in a non-space orientated area of interest with

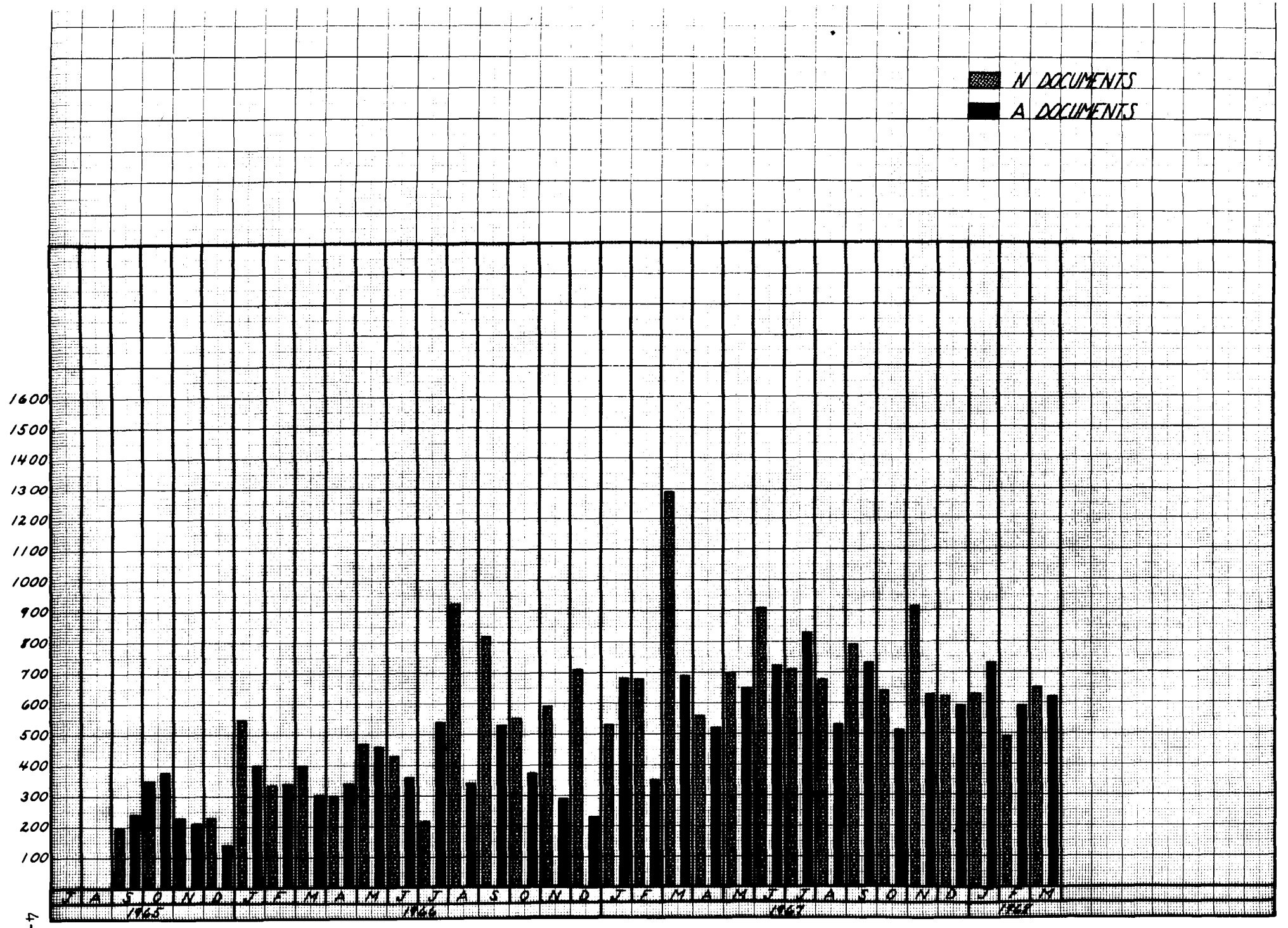

Figure 4-16. Document Service Per Month

one-to-one relationships between information identified in the NASA files and applications to product or process development.

The results of our efforts to document 'impact' resulted in enthusiastic but indefinite responses such as 'very useful', 'very satisfied', 'high quality', 'substantial contribution', '25% of citations not revealed by other sources', 'useful records of parallel failures'. (Appendix C contains a number of letters from industrial clients documenting their opinions about the NASA/Pitt RDC activity.)

It has been a source of considerable concern to us that we have not been able to elicit more than a minimal number of 'transfer' cases in the past, particularly those that provide quantitative evidence of usefulness. However, the NASA/TUD memo of March 25, 1968, which discussed follow-up items to the March 8, 1968, ACCORD meeting, began to provide a hint to the probable reason for the lack of success in reporting transfers.

The majority of transfers documented in various reports and discussed at various meetings appear to have resulted from efforts whose 'purpose' was the solution of a specific problem. Even at KASC, our most successful transfer, the flame fusion furnace of Semi-Elements, Inc., was the result of a problem solving search. Also, the Norbatrol 'transfer', although a negative one, resulted from efforts to solve a specific problem.

The important factor here is that although the major portion of our KASC activities is of the current awareness type service, our efforts

to document transfers or impact have been directed towards results most commonly achieved by problem solving efforts.

The total number of profiles serviced during the reporting period has been reported as 1481 unique profiles. Of this total, 89% was comprised of current awareness type service, and only 11% was comprised of retrospective profiles only. Even these 11% cannot be considered 'problem solving' efforts. The majority were simply state-of-the-art surveys for background data not necessarily applicable to a specific problem. Thus, our efforts to document impact and transfers has been less than successful because our approach has been incorrect for our type of activity.

It is hypothesized that current awareness service is directed to keeping an individual in industry continuously aware of developments in an area of interest, but not necessarily related to a pressing problem of the moment. Accordingly, it is expected that information provided in this way is integrated into the thinking of the reader, to be applied at an appropriate time to making decisions on a proper course or direction of activity. Since this event may take place inpredictably and usually much later than when the information is received and read, it becomes difficult (sometimes impossible) to identify which source provided the critical information used.

Accordingly, the emphasis now will be placed on developing a methodology for documenting <u>impact</u> resulting from current awareness type service. Our initial inclination is to use the "DRI General Interview Guide" as a basis for developing an analogous list of questions

to be used by our interviewers. Coupled with our contact procedure, this approach is expected to result in a decided increase in both the quality and quantity of documented 'evidence of impact.'

Currently, each subject specialist (engineering consultant or KASC analyst) is required to contact his industrial counterpart at least once a quarter. The results of the contact are documented and submitted to KASC. If no contact record is shown for the quarter, a tickler system flags the consultant and the company which is to be contacted.

At present, each consultant/analyst phrases his own questions reference impact/transfer and the results have been inadequate. The set of questions developed specifically for impact documentation will be discussed with the consultant/analyst group prior to incorporation into the 'system.' Once approved, all personnel will be required to use these questions as guides to the interview.

PROGRESS TOWARDS SELF-SUFFICIENCY

The term self-sufficiency, within the context of this report, is intended to mean the ability of the KASC RDC to maintain effective dissemination activities without financial support from NASA.

Although various alternate routes are being investigated to obtain support for the RDC, and the University has committed itself to this end, this report will deal only with the subject of self-sufficiency from the point of view of analyses at the operational level to achieve economies in operating procedures and to increase industrial

participation.

Operational Analysis

The current industrial fees being paid KASC by participants in the T/U program were not established on the basis of any systematic analyses. In addition, it is a fact that current industrial income would not be sufficient, if NASA funds were withdrawn, to support the dissemination activities of the Center at its current level of operation.

Under these circumstances, it became incumbent upon KASC to apply some methodology to the study of its operating costs, on a service-element basis, so that realistic fee schedules could be established. In addition, if industrial income were not available to maintain operations at the current levels, then some methodology was needed to determine the necessary resources and their allocation for different levels of operation.

Approach to the Problem

Preliminary discussions about methodology became bogged down in discussions about the ever illusive 'variables.' Finally, the functional analysis approach was chosen for two rather basic reasons: (1) talk alone would not get the job done, and a decision was needed; and (2) this technique had been used successfully in industry and there was reason to believe it could be applied to advantage here. Briefly and very generally the reasoning was as follows:

During the past two decades new management concepts have been

introduced and applied successfully in the procurement, performance and evaluation of research and development programs. Among these innovations are the incentive contract, the PPBS (Planning, Programming and Budgeting System), and the systems analysis technique with such variations as the CPM (Critical Path Method) and PERT (Program Evaluation and Review Technique).

The CPM is a tool for determining the critical path for the flow of work and is concerned primarily with precedence relationships. This technique identifies functions and their relationships, but is not concerned primarily with the resources necessary to perform the function.

PERT is a decision-making tool for the determination of the most feasible alternate to the critical path when such an alternate is mandated by unexpected events, e.g., a delay in receipt of needed equipment, or a change in the scope of the task with no compensating change in the performance schedule. PERT is used to vary precedence relationships in order to adjust to unexpected constraints placed upon the program.

Functional analysis is common to all systems analysis techniques. This tool is used primarily to determine the actual resources (equipment, materials and manpower) required to implement a function. Upon identification of all necessary resources, the respective costs of each function are determined and the overall system cost is established.

In addition, functional analysis in conjunction with CPM can be

used as a tool for organization. Similar functions can be identified and optimum organization and utilization of equipment can be attempted.

The tools identified above are being used effectively in industry today by responsible personnel who must make decisions on the basis of limited information and who must allocate resources according to priorities and time and economic constraints. Such decisions are not peculiar to industry alone. The proper allocation of resources, time constraints, and economic considerations are common to practically all fields of endeavor. If functional analysis, CPM and PERT have been successfully used in industry, it seems reasonable to believe that these same tools can be applied effectively in other fields of endeavor.

KASC decided to give it a try. First, in a 'quick' approach to determine feasibility and then in a more comprehensive and detailed effort to achieve the degree of validity the 'professional' manager would accept and support with confidence and professional pride.

The steps taken in this first 'cut' were identified as follows:

1. The KASC operational system was to be diagrammed in its precedence-function relationship.

2. A functional analysis was to be performed to determine the manpower and material requirements of the overall system at its present level of operation.

3. The cost of each service element was to be determined on the basis of the functional analysis and compared against existing fees.

4. Analysis data would be confined to manpower and material costs only. No capital equipment costs would be included in this first cut.

The first step in the experiment was the preparation of a diagram identifying all the system functions in their precedence relationships. The symbols frequently used in PERT diagramming were used here, i.e, a circle (bubble) was used to represent an event, and a line with an arrow was used to represent an activity. An event is the culmination of an activity and requires no expenditure of funds or manpower. In our context, an event is synonomous with a function.

Diagramming the system was more difficult than anticipated. The problem was not the identification of work flow, but in 'slowing down' the mind to think one function at a time (rather than grouping them, as would an experienced worker). Work habits are set and it was only after much diligent (often exasperating) and patient effort that the overall system was diagrammed (Figure 4-17) in sufficient detail to permit an attempt at analysis.

A group analysis of the overall system was attempted first. The supervisors of the KASC system were asked to meet <u>together</u> to determine the best estimate of labor, equipment, and materials necessary for the implementation of each function. This approach was unsuccessful (the failure was anticipated, but the attempt was made simply to get the participants into the spirit of things) and two 'needs' became very apparent.

The first was a need for separate diagrams for each major service element, e.g., a computer retrospective search, production for an N-type document, a manual retrospective search, or the 'no document available' notification.

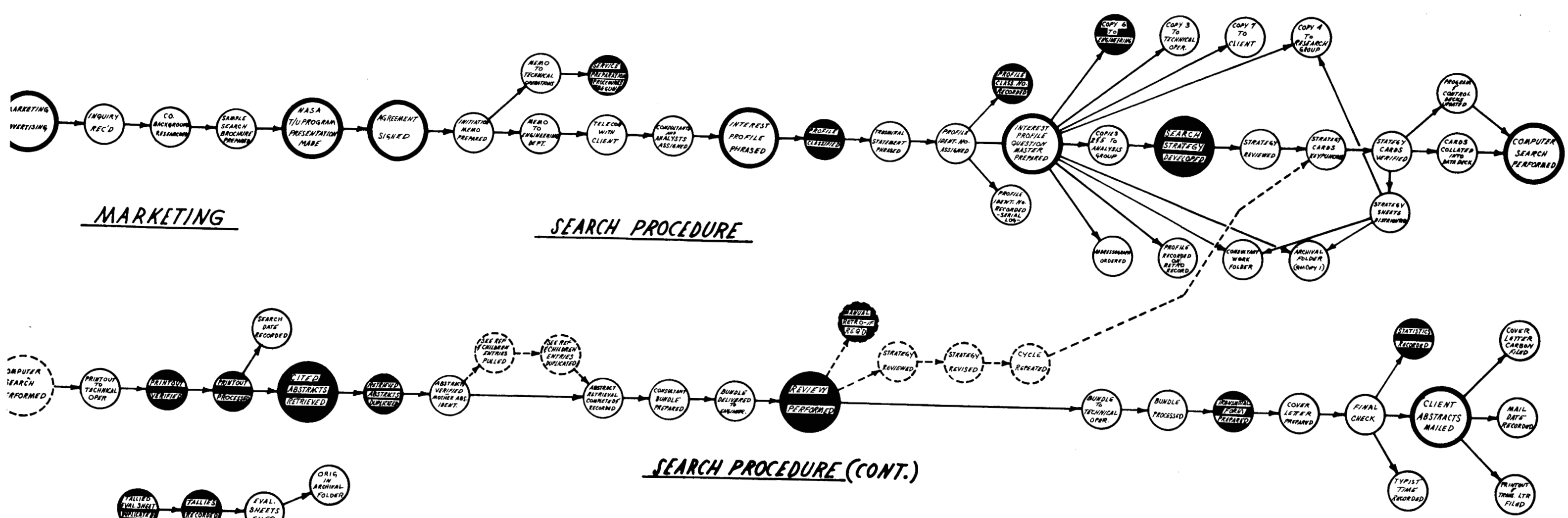

FIGURE 4-17 B

NASA-PITT T/U PROGRAM

FLOW DIAGRAM

Fig. 4-17 A

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The second need was to have each supervisor work separately with the personnel assigned to him (her) in evaluating the accuracy of the 'bubble' chart and estimating the amount of time, materials and equipment necessary to perform the various functions comprising the overall service element.

The diagramming cycle was repeated, with the same difficulties as experienced before (only the degree varied) and culminated in the 'bubble' charts shown in Figures 4-18 through 4-24. Each bubble was given an identification number.

Analysis

The analysis effort was comparatively simple to achieve--although it was time consuming. To facilitate (and to standardize the compilation of data) the analysis, a simple form was designed (Figure 4-25) which called for a description of the function being analyzed, identification (and quantities) of the equipment and materials needed to perform that function, and the type and amount of labor to be expended on that function. A separate form was prepared, for each function appearing on a service unit chart, and given an identification number which coincided with that of a 'bubble' on its relevant diagram.

When the compilation of data was completed, totals were calculated and an overall cost figure was arrived at as follows:

- Professional manhours (direct labor) was converted to dollars at an average rate of $5.50 per hour.
- Clerical manhours (direct labor) was converted to dollars at an average rate of $1.75 per hour.

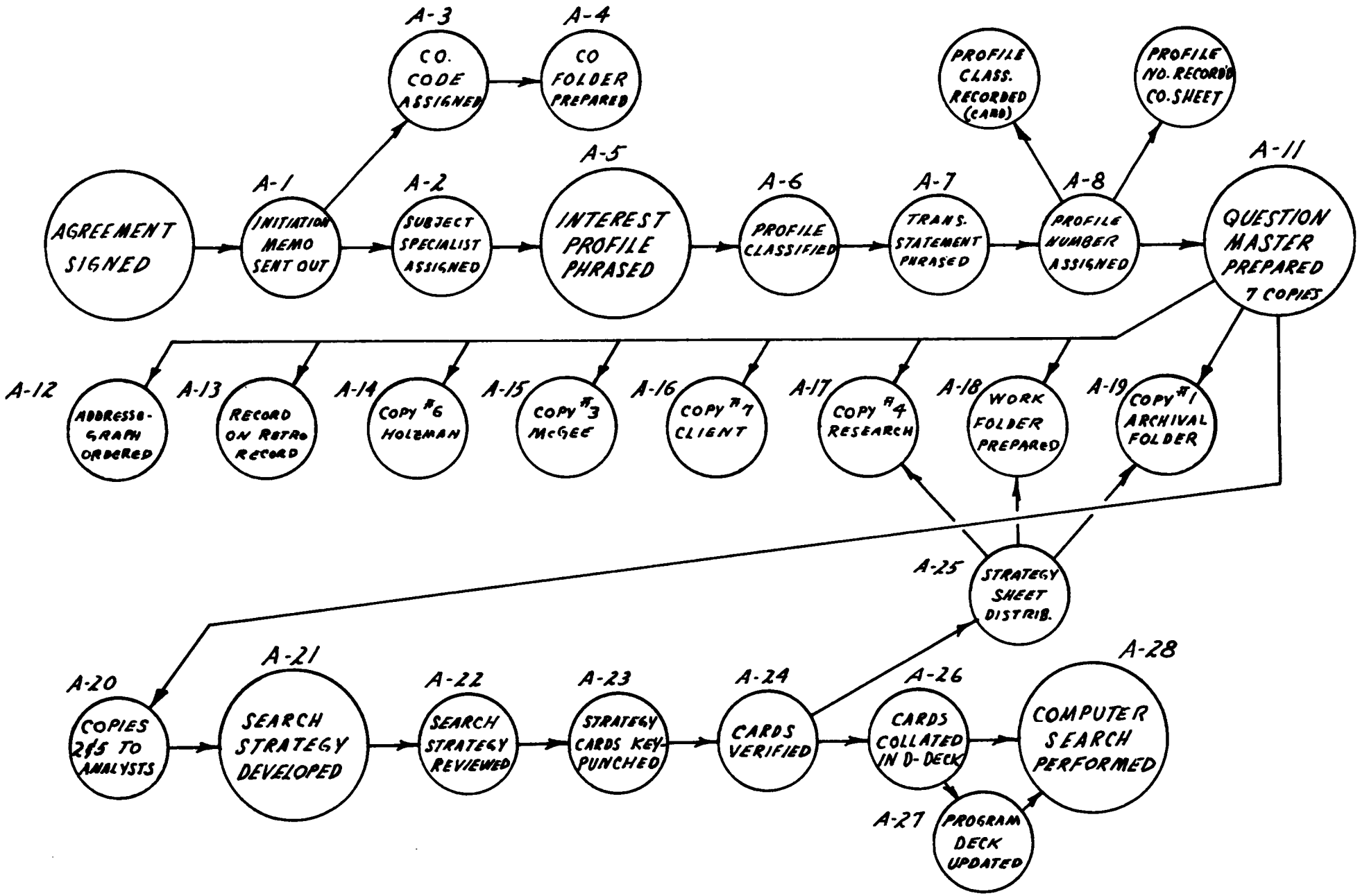

Figure 4-18. Computer Search Procedure (Sheet 1 of 3)

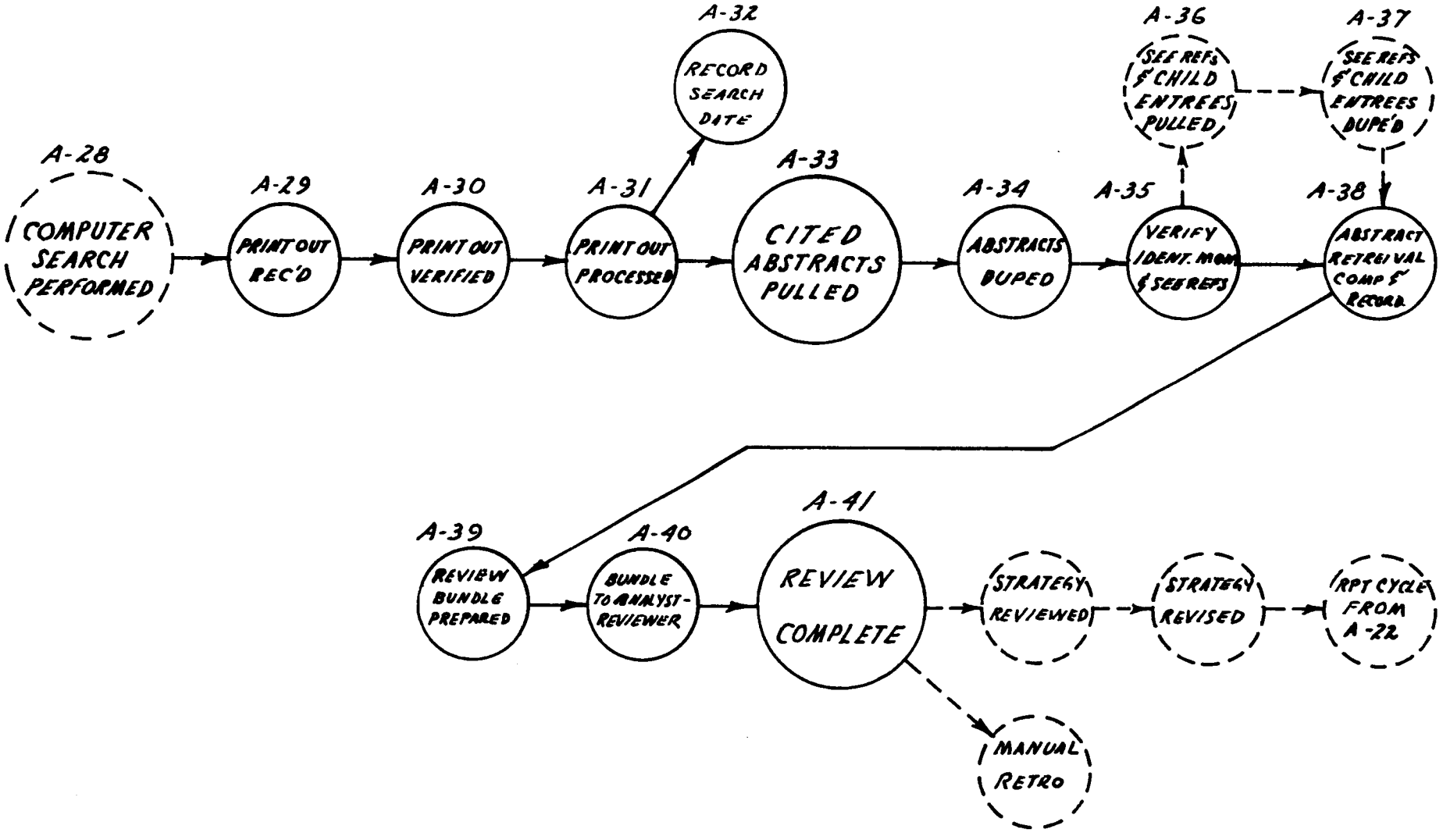

Figure 4-18. Computer Search Procedure (Sheet 2 of 3)

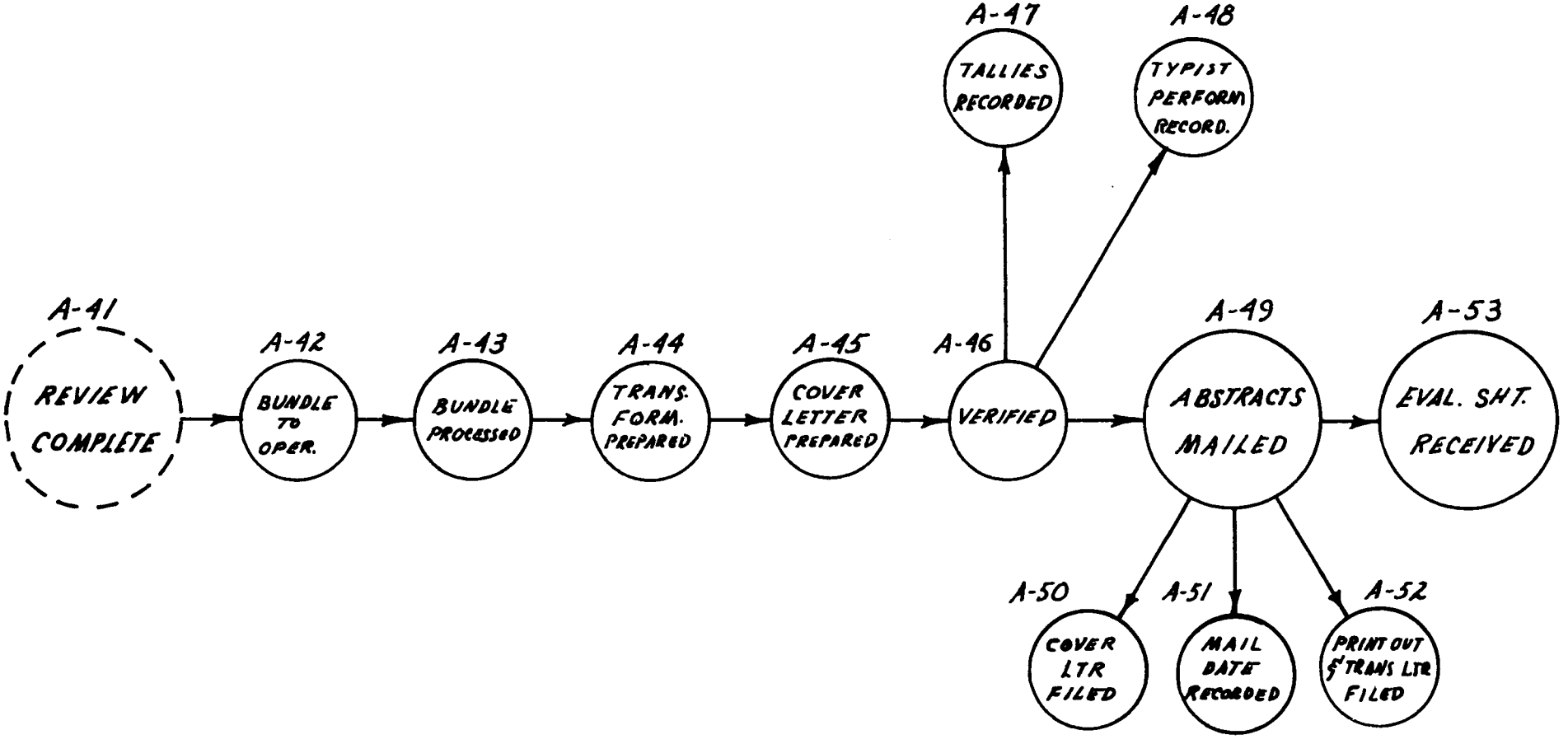

Figure 4-18. Computer Search Procedure (Sheet 3 of 3)

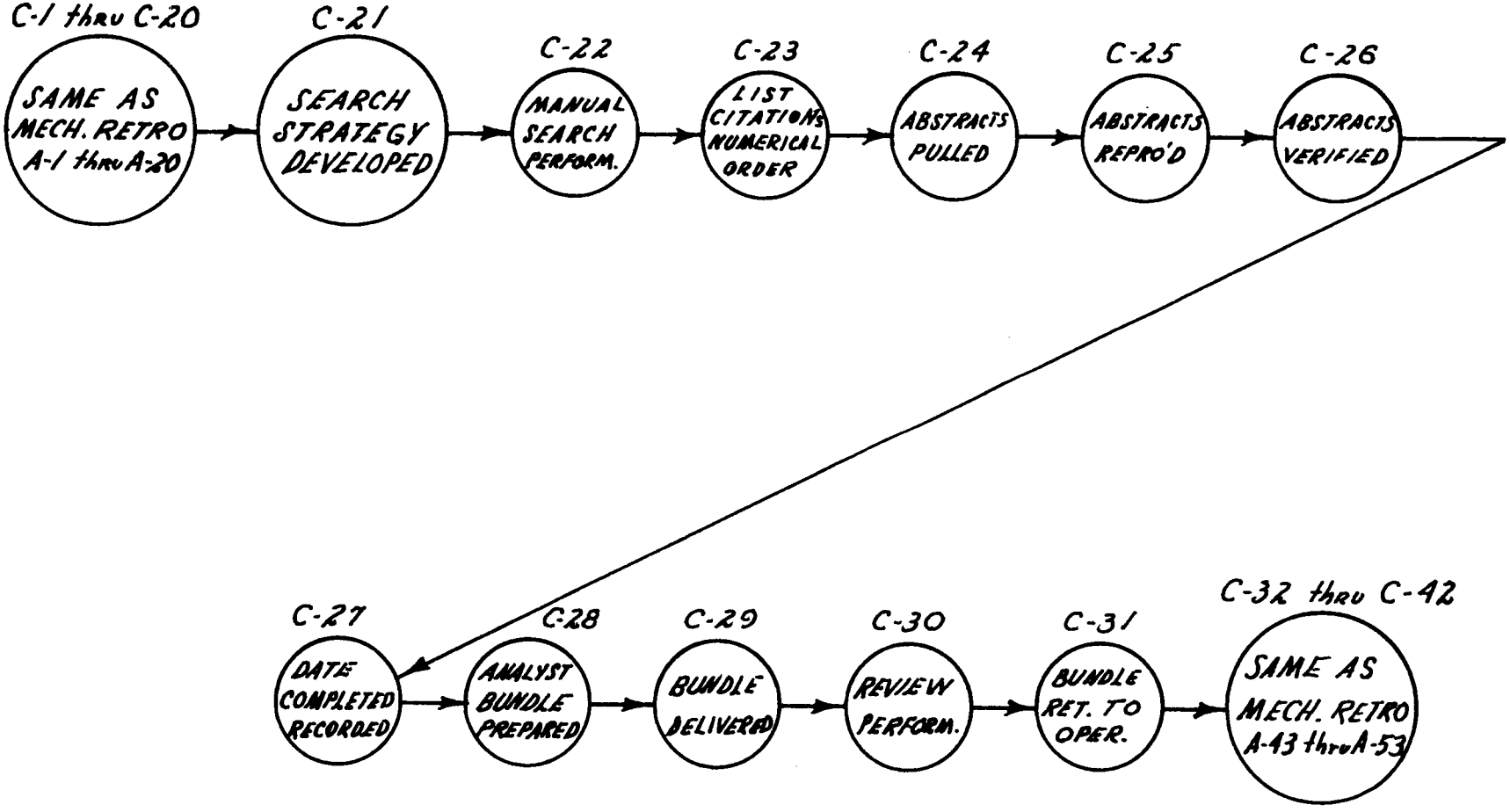

Figure 4-19. Manual Search Procedure

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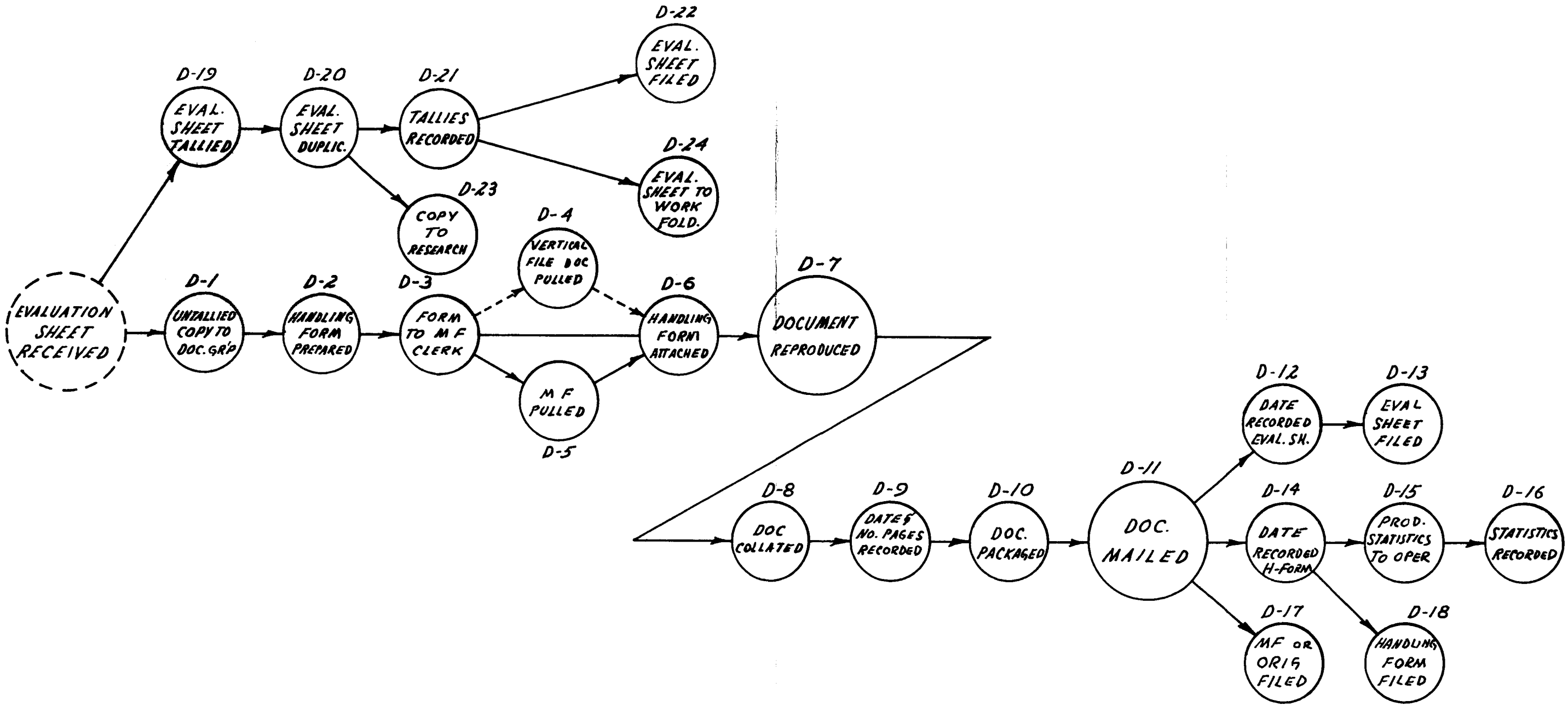

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Figure 4-20. N-Document Production Cycle (KASC)

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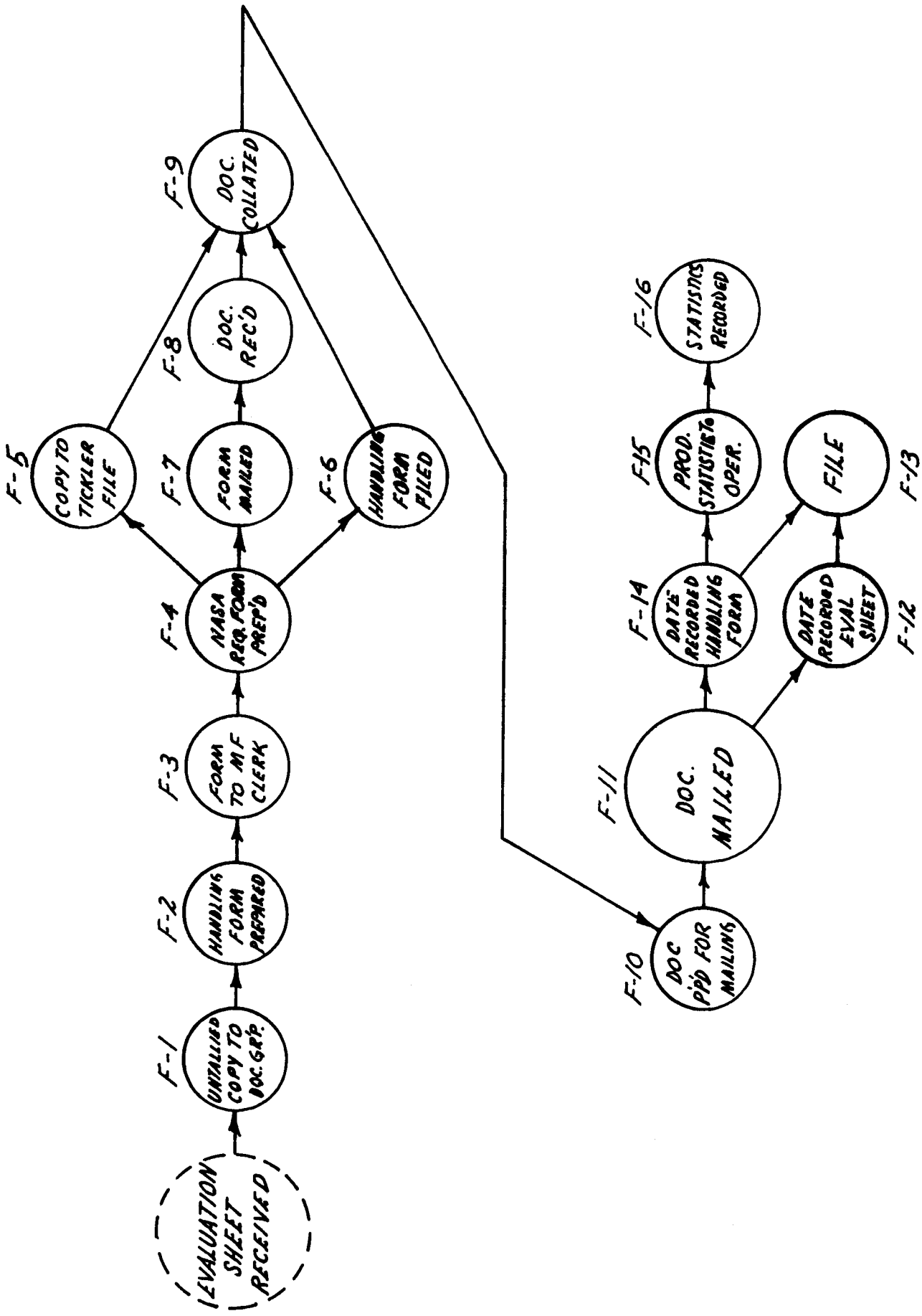

Figure 4-21. N-Document Production Cycle (NASA)

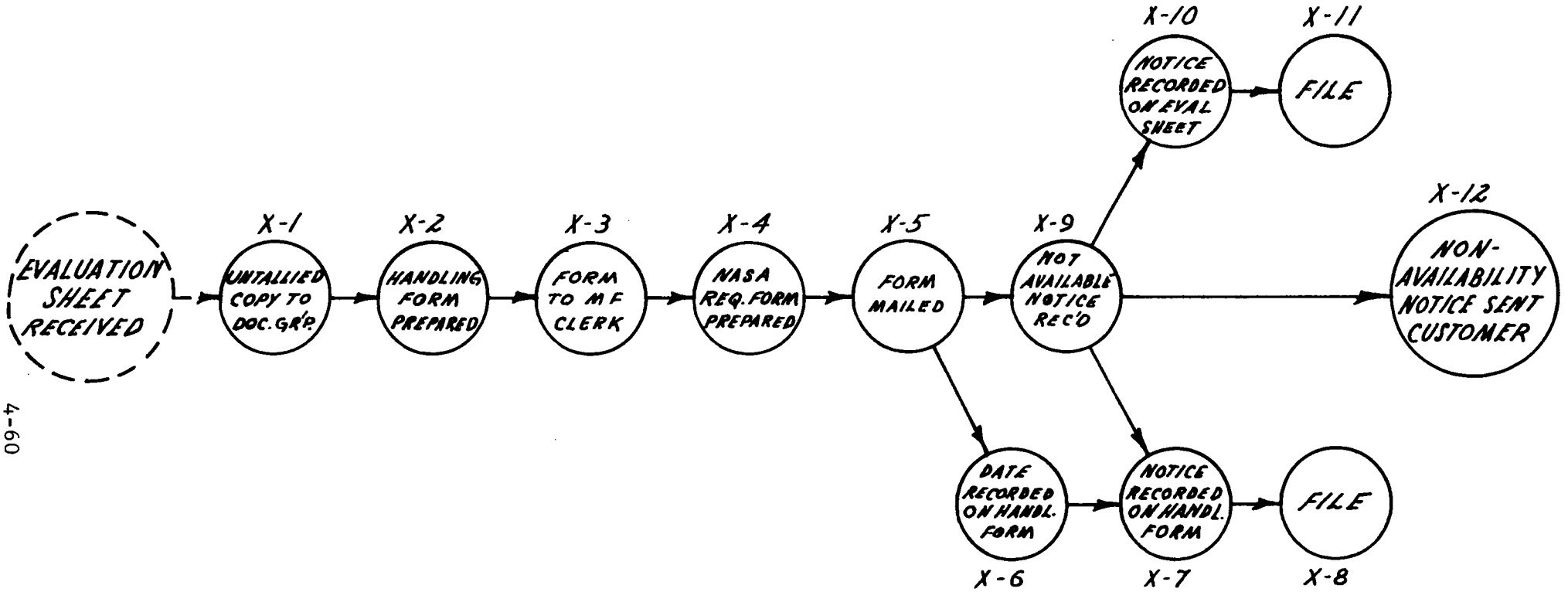

Figure 4-22. N-Document Not Available Cycle

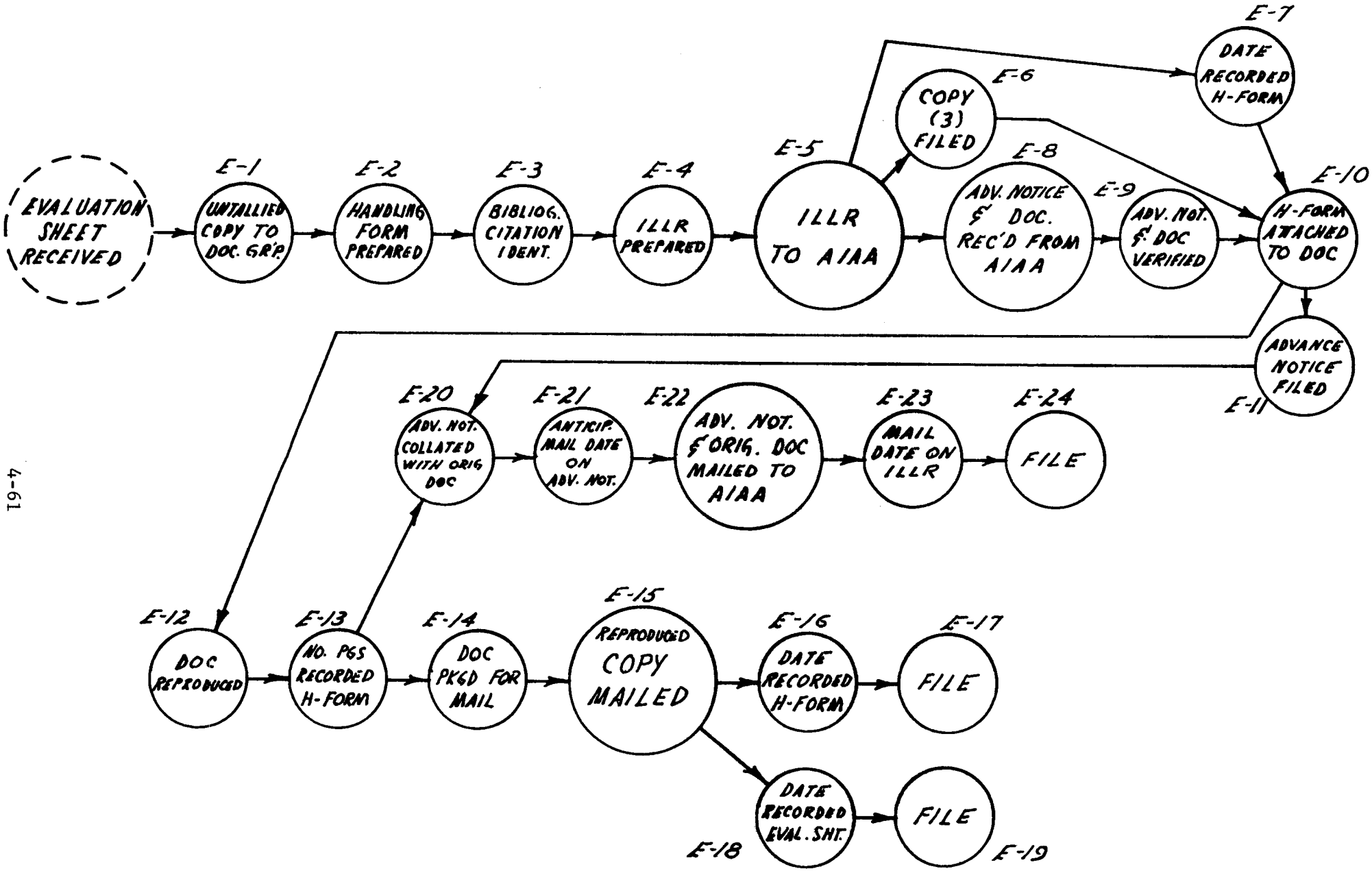

Figure 4-23. A-Document Production Cycle

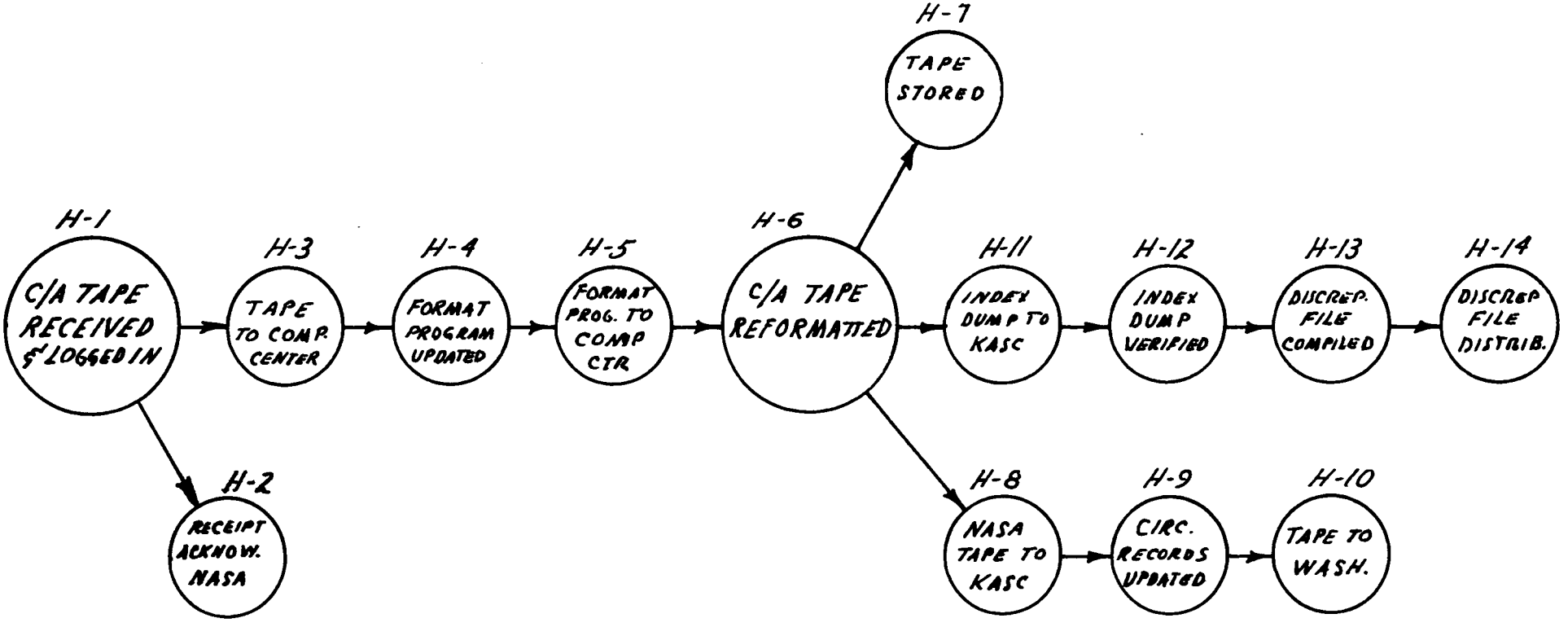

Figure 4-24. NASA Tape Reformat Cycle

DESCRIPTION			
EQUIPMENT	QTY	COST PER UNIT	TOT. COST
TOTALS			
MATERIALS	QTY	COST PER UNIT	TOT. COST
TOTALS			
MANPOWER	M-HRS	RATE	TOT. COST
TOTALS			
CYCLE		FUNCTION NO.	

Figure 4-25. Functional Analysis Form

- Secretarial manhours (administrative) was computed as a percentage of direct labor based on one year's activities of the overall program. (Two administrative secretaries for an overall group of approximately 40 full-time and part-time employees.) Conversion to dollars was made at the same rate per hour as for clerical workers. (Actual secretary scale is higher than for clerical.)

- Professional supervision (administrative and marketing) also was computed as a percentage of direct labor. Three 'supervisors' (includes a marketing man) for the same size group as in the previous paragraph. Conversion to dollars was made at the same rate as for direct labor manhours (a low figure).

An overhead percentage of 46.9 was applied against direct labor, both professional and clerical, and a fringe benefits percentage of 7.8 was applied against direct labor, both professional and clerical. Travel costs were prorated. Computer costs were based on actuals. Material costs were based on actuals, and general and administration costs (paper clips, pencils, etc.) were estimated at 1% of all costs except overhead and fringe benefits.

These figures were sufficiently conservative to give us a degree of confidence in the results being in the 'ball park.'

The summary of findings is best shown graphically. The chart (Figure 4-26) is (I believe) self explanatory. The 'Cost Analysis' column reflects the cost figures arrived at by analysis and <u>does not</u> include document service. The 'Current Fee' column reflects the current fee schedule quoted to industry and <u>does</u> include document service.

One other factor should be emphasized. Estimates of time necessary to perform respective functions were subjective estimates--not clocked time and motion studies. Some functions were estimated at

SERVICE UNIT		PROF.	CLERICAL	OH	FB	TRAVEL	COMPUTER	MTL'S	G/A	TOTAL *	CURRENT FEE **
Current Awareness	hrs	13.47	10.27	43.17	7.18	.57	3.17	9.72	1.05	$156.92	$125
	$	74.09	17.97								
Retrospective	hrs	7.14	7.51	24.58	4.09	.57	13.86	13.50	.80	$109.80	$250
	$	39.29	13.11								
Current Awareness plus Retrospective	hrs	19.36	16.55	63.52	10.56	1.14	17.03	23.22	1.57	$252.48	$150
	$	106.48	28.96								

* This column represents service unit costs based on the functional analysis and does not include document costs.

** This column represents service unit costs currently in effect and does include free document service.

Figure 4-26. Summary of Analysis Findings

five seconds (which is really pretty finite for a human activity). The point is that the time estimates were ultra-conservative.

The columns identified as 'Professional' and 'Clerical' show two sets of figures. The upper set is manhours; the lower set is dollars.

Cost of Operations

The functional analysis costs per unit of service were checked against budget records for the month of December, 1967 (the functional analysis was performed in January, 1968).

The approach taken for this comparison was to apply the unit of service cost against the total units of each type of service processed during the year. The results were as follows:

Current Awareness:	968 x $156.92	=	$151,898.56
Retrospectives:	163 x 109.80	=	17,897.40
Combination:	350 x 252.48	=	88,368.00
	1481		$258,163.96
KASC costs for document service (approx)			35,000.00
TOTAL OPERATION COST			$293,163.96

The records for December, 1967, indicate a total operating cost of approximately $24,981. Based on this monthly cost, the total operating expenditures for one year was computed as $299,772.

The results of this comparison served to give us confidence that the results of our functional analysis have a considerable degree of validity. However, we are planning to repeat the analysis, stressing a greater degree of accuracy in our time estimates. In addition, we intend to evaluate the individual functions to determine possible

approaches towards improved efficiency and cost reductions.

Levels of Operation

On the basis of the preliminary functional analysis, a brief study was conducted to consider increasing the types of service units which would be made available to potential participants. Tentative conclusions indicated agreement on the following types of services:

Type I:
- **Computer output only** (citation accession numbers)
- Strategy formulation on basis of telecon (no travel by KASC personnel)
- No screening of search output
- **No abstracts**
- **Document service at $0.05/page**

Type II: Same as Type I, except an abstract will be furnished for each citation.

Type III: Our current service, except that document service will be at $.05/page.

The initial study resulted in the cost breakdown shown in Figure 4-27.

Utilizing these cost figures, and considerable 'crystal ball' gazing, the linear curve shown in Figure 4-28 was plotted. This curve is intended as a tool for 'projections.' Thus, if an income of $100,000 per year is projected, then the personnel required would be a little less than four professionals and a little more than four clericals. This number of personnel could handle any kind of mix of the various services, as long as the total dollar value of these services did not exceed $100,000 (based on the fee per unit).

SERVICE UNIT	PROF.	CLERICAL	OH	FB	TRAVEL	COMP.	MTL'S	G/A	TOTAL
TYPE I:									
C/A No Review - No Abstracts	1.47 8.09	1.96 3.44	5.36	.89	.57	3.17	-	.15	21.67
Retro No Review - No Abstracts	1.45 7.99	1.77 3.10	5.20	.86	.57	13.86	-	.25	31.83
C/A + Retro No Review - No Abstracts	1.70 9.36	2.77 4.84	6.66	1.11	1.14	17.03	-	.33	40.47
TYPE II:									
C/A All Abstracts - No Review	2.16 11.85	5.89 10.32	10.39	1.73	.57	3.17	9.72	.35	48.10
Retro All Abstracts - No Review	2.20 12.09	6.08 10.64	10.66	1.77	.57	13.86	13.50	.51	63.60
C/A + Retro All Abstracts - No Review	3.13 17.22	11.01 19.27	17.11	2.85	1.14	17.03	23.22	.78	98.62
TYPE III:									
C/A Eng. Rev. + Rel. Abstracts	13.47 74.09	10.27 17.97	43.17	7.18	.57	3.17	9.72	1.05	156.92
Retro Eng. Rev. + Rel. Abstracts	7.14 39.29	7.51 13.11	24.58	4.09	.57	13.86	13.50	.80	109.80
C/A + Retro Eng. Rev. + Rel. Abstracts	19.36 106.48	16.55 28.96	63.52	10.56	1.14	17.03	23.22	1.57	252.48

Figure 4-27. New Services Fee Structure - Preliminary

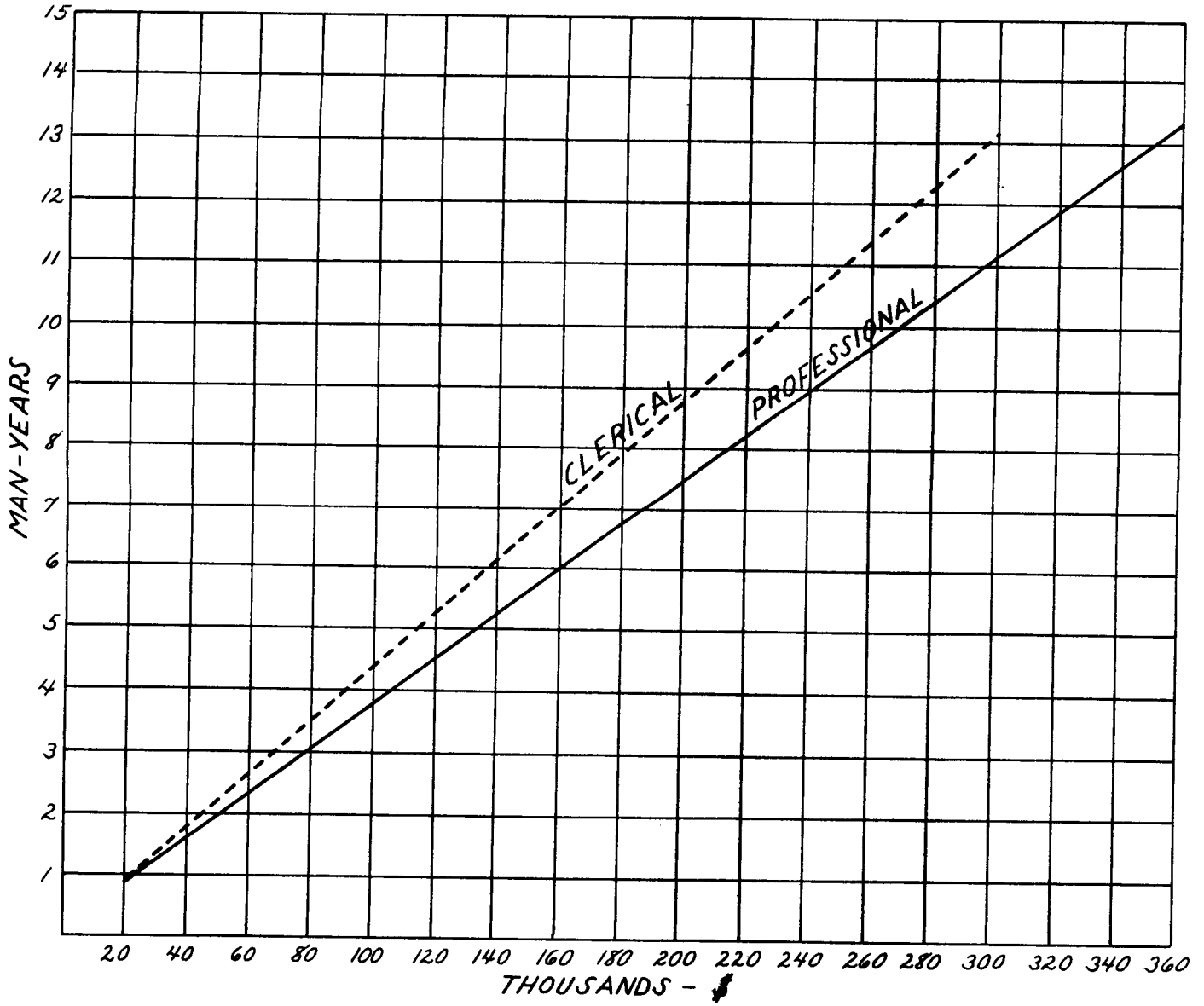

Figure 4-28. Operational Levels - Crystal Ball

Analysis Conclusions

The analysis indicates, quite dramatically, that KASC's current services are underpriced. Also, noting that time estimates, though not 'scientific', were quite conservative and that document costs were not included in the analysis results, it is very apparent that a more thorough analysis should be performed and that the pricing schedule be changed as soon as practicable--even if new fees have to be predicated on the 'first cut' analysis.

In addition, the functional analysis should be used as a basis to determine if procedural changes can be implemented to reduce costs and/or increase efficiencies.

Marketing

Marketing efforts to increase industrial participation will concentrate on selective marketing for new clients and increased emphasis on capturing 'renewal' clients.

Selective Marketing

In this area, the approach will be to obtain a list of companies on the basis of selected SIC codes and geographic location. Then, an extensive direct mail program will be directed towards the companies.

In addition, a marketing program plan is to be prepared which includes estimates of utilization of all marketing tools and projections for anticipated sales.

Renewals

A client contact system is being implemented whereby each consultant/ analyst assigned to a participating client will be 'tickled' if he has not made a quarterly contact with his counterpart at the company he is serving. A written report is to be prepared evaluating the contact and recommending necessary action.

At the six-month period of service, a 'public relations' type call will be made to determine progress to date and to identify potential problem areas. In addition to identifying problem areas, this visit is intended to induce participants to increase the extent of their use of the system.

APPENDIX A

MARIANNE de KORVIN

Degrees:	B.A. General Science, Quilmes National College (Buenos Aires).
Graduate Work:	Medical School, University of Buenos Aires; Law School, Buenos Aires; Anatomy, Brain Mechanisms and Behavior, Basic Neurological Sciences, Neuroendocrine Seminars, University of California, Los Angeles.
Societies:	Medical Library Association.
Field of Interest:	Medicine (i.e., Basic Neurological Sciences, Pharmacology).
Experience:	Neuroendocrinology, neuropharmacology, neurology, electronmicroscopy, pathological aspects of the central nervous system, etc.

BAHAA EL-HADIDY

Degrees:	B.S. Chemistry and Geology, Cairo University M.L.S. Library Science, Rutgers, the State University.
Graduate Work:	Geology, Western Reserve University; Petroleum Chemistry, Cairo University; Candidate for Ph.D. in Library and Information Science, University of Pittsburgh.
Societies:	American Society for Information Science, American Library Association, Special Libraries Association, Geoscience Information Society.
Field of Interest:	Information Science.
Experience:	Geoscience Information.

SUNANDA MAJUMDAR

Degrees:	B.S. Physics, Presidency College M.S. Physics, Calcutta University
Graduate Work:	Graduate School of Library and Information Sciences, University of Pittsburgh.
Field of Interest:	Solid State Physics.
Experience:	Uses of solid state physics as applied to the development of science and technology.

EDWARD M. PHILLIPS

Degrees: B.S. Chemical Engineering, Lafayette College
M.S. Chemical Engineering, Northwestern University

Graduate Work: Candidate for Ph.D. Chemical Engineering, University of Pittsburgh.

Publications: "The PVT Behavior of Binary Hydrocarbon Mixtures." A.I.Ch.E. Jnl. 7, 413 (1961).

"The PVT Behavior of Ethane in the Gaseous and Liquid States." Soc. Pet. Engineers Jnl. 2, 83 (1962).

"Now Figure Tray Flooding Closer." Pet. Ref. 43, #8, 159 (1964).

"Pulsation Flow in a Rigid Tube Part I: A Theoretical Study of Velocity Profile and Friction Losses during Sinusoidal Newton Flow." Submitted to Chem. Eng. Sci., 1968.

Societies: American Institute of Chemical Engineers, Instrument Society of America, Tau Beta Pi, Sigma Xi, Phi Lambda Upsilon.

Field of Interest: Chemical Engineering Transport Phenomena, Process Dynamics and Control.

Experience: Reaction Kinetics, Automatic Control, and Process Dynamics.

CONSTANCE M. MELLOTT

Degrees: B.S. Physics, Mt. Union College
M.S. Library Science, Western Reserve University
Advanced Certificate, Library Science, University of Pittsburgh.

Graduate Work: Ph.D. Candidate, Library Science, University of Pittsburgh.

Societies: American Library Association, American Society for Information Science.

Field of Interest: Physics.

Experience: Carbon and graphite technology.

LILY A. EL-HADIDY

Degrees:	B.S. Chemistry and Zoology, Cairo University M.S. Analytical Chemistry, Cairo University M.S. Biochemistry, Rutgers, the State University
Graduate Work:	Candidate for Ph.D. in Biochemistry, University of Hawaii.
Publications:	"The Microdetermination of Iodine, Calcium, and Magnesium in Egyptian Drinking Water and their Goitrogenic Significance." Master's Thesis. "Iodine and Goitre in Egypt." Paper read at the 4th International Goitre Conference, London, 1960.
Societies:	Egyptian Chemical Society.
Field of Interest:	Analytical, Bio-, Clinical Chemistry. Physiology, Nutrition, Zoology, Botany.
Experience:	Microanalysis of Iodine, Protein and Enzyme Chemistry, Isolation and Purification of Liver Cell Membranes, Active Transport of Molecules through Semipermeable Membranes, Protein Biosynthesis, Nucleic acids and the Genetic Code, Nutritional Iodine Deficiency and the Prevalence of Goitre.

BETTY ELY

Degrees:	B.S. Biology-Chemistry, Grove City College M.S. Library Science, University of Pittsburgh
Graduate Work:	Geology, Industrial Microbiology, Biochemistry, Advanced Inorganic Chemistry and Analytical Instrumentation, Data Processing and the Library.
Societies:	Spectroscopy Society of Pittsburgh, Society of Applied Spectroscopy, Beta Phi Mu.
Field of Interest:	Inorganic and analytical chemistry.
Experience:	Emission spectroscopy, Water Pollution, Textiles (thread), Clay, including drilling muds.

ELIZABETH P. HARTNER

Degrees:	B.S. General Science, Carnegie-Mellon University M.S. Physical Chemistry, Carnegie-Mellon University
Graduate Work:	Physical Metallurgy, Carnegie-Mellon University, Pennsylvania State University; Graduate School of Library and Information Sciences, University of Pittsburgh.
Publications:	Co-author of "The Tensile Properties of Pearlite, Bainite, and Spheroidite." Trans. American Society for Metals, 1942. Co-author of "The Mechanical Properties of the Isothermal Decomposition Products of Austenite." Trans. American Society for Metals, 1940. Electron Microscopy Across the World. Metal Progress, June, 1963. New Electron Metallography. Metal Progress, March, 1962. Digests for Metal Progress; Abstracts for Chemical Abstracts. Portions of First Supplement to "Constitution of Binary Alloys." (Hansen) as edited by Rodney P. Elliot.
Societies:	American Institute of Mining and Metallurgical Engineers, American Society for Information Science, American Association for the Advancement of Science, American Chemical Society, Sigma Xi.
Field of Interest:	Physical Metallurgy.
Experience:	Correlation of crystalline and micro-structures with the properties of metals and alloys.

WILLIAM A. POLEY

Degrees:	S.B. Physics, University of Chicago M.S. Engineering Science, University of Toledo
Graduate Work:	Candidate for Ph.D., Systems Management Engineering and Operations Research, University of Pittsburgh.
Publications:	Co-author, NASA-TN-D-1560 "Low-Power Test of Plum Brook Reacter Core." Editor of "Final Hazards Summary--NASA Mock Up Reacter." Author of various internal NASA Reports.
Societies:	American Nuclear Society American Inst. Aeronautics and Astronautics Operations Res. Society of America
Field of Interest:	Nuclear Reactor Physics and Engineering, Management Science, Systems Management, and Operations Research.
Experience:	Experimental Reactor Physics, Systems Management, Operations Research.

APPENDIX B

THE KNOWLEDGE AVAILABILITY SYSTEMS CENTER
UNIVERSITY OF PITTSBURGH • PITTSBURGH, PENNSYLVANIA 15213 • PHONE 621-3500

January 1, 1968

Mr. John L. Roberts, President
J. L. Roberts Company, Inc.
101 Main Street
New York, New York

Dear Mr. Roberts:

The scientific and technological files of the National Aeronautics and Space Administration--comprising over 250,000 documents (indexed on computer tapes) and increasing at a rate of approximately 5,500 items per month--have been made available for use by private industry.

These files represent one of the major sources contributing to the tremendous amount of written material being generated every year. The quantity alone of scientific and technical data makes it physically impossible for individual scientists, engineers, managers, administrators, and supervisors to keep current in their respective fields. Thus, research is often duplicated, new technologies remain undiscovered and new techniques and disciplines remain hidden in a mass of untapped knowledge.

The NASA files, however, can be tapped.

This extensive data bank is a computerized reservoir of knowledge, from both national and international sources, which can be searched conveniently and expeditiously for current and retrospective literature. Exploitation of these files, through participation in the NASA/Industry/University of Pittsburgh Technology Transfer Program, can be achieved in various ways. For example:

Current Awareness Searches. The most recent literature--published and unpublished--can be searched on a monthly basis for items peculiar to your specific interest profiles.

Retrospective Searches. State-of-the-art surveys can probe the data bank to a depth of one, two, three, or four years. Or, a specific question--relating to some problem--can be searched for literature relating to that problem.

Your participation in this program is encouraged because we are convinced that it will contribute to the prevention of wasteful duplication of your company's research efforts and funds, it will aid your personnel in keeping current in their respective fields, and it can make available to you new scientific and manufacturing techniques of potential value to your company and other business and industrial users.

The present list of participating members in the NASA/Industry/University of Pittsburgh program numbers approximately 65. These firms range from small organizations employing as little as a dozen employees to such industrial giants as U. S. Steel, Pittsburgh Plate Glass, and Westinghouse Electric Corporation. A list of these subscribers is submitted for your review.

The National Aeronautics and Space Administration has commissioned the University of Pittsburgh to acquaint industry--at no obligation--with this program and to administer it in this area. As a member of the University staff, I have been assigned this responsibility.

If you are interested in knowing more about our program and how it can benefit your company, please contact me and I will be very pleased to discuss it with you in more detail.

Very truly yours,

elw
Enc.

FIRST FOLLOW-UP LETTER

THE KNOWLEDGE AVAILABILITY SYSTEMS CENTER
UNIVERSITY OF PITTSBURGH • PITTSBURGH, PENNSYLVANIA 15213 • PHONE 621-3500

February 1, 1968

Mr. John L. Roberts, President
J. L. Roberts Company, Inc.
101 Main Street
New York, New York

Dear Mr. Roberts:

Recently I wrote to acquaint you with the NASA Technology Transfer Program and to encourage you to exploit it to your advantage. Our services--individualized and completely confidential--provide retrospective searching of the entire unclassified NASA files and, on a monthly basis, a review of new literature entering the system to identify that which is appropriate to your current interests.

During the past year we have been searching more than 1000 interest profiles per month for approximately 65 participating members who are putting to advantage the scientific and technological knowledge available to them in the NASA files. I have enclosed a partial list of typical interest areas into which these questions are categorized. Perhaps some of these reflect one or more of your own company interests.

I am convinced that participation in this NASA/Industry/University of Pittsburgh spin-off program can benefit your company. Our faculty and Center personnel have an almost day-to-day contact with new applications of science and technology. These personnel phrase your questions for computer search, evaluate out-put and insure submittal to you of only pertinent literature, and through verbal and written communication with you can facilitate the identification of literature related to your company interests.

We at the KAS Center of the University of Pittsburgh are confident that we can be of help to you. Do contact me for any questions you may have about our service and how you can exploit the NASA files to the benefit of your company. I will be pleased to visit you to discuss the program in more detail.

Yours truly,

elw
Enc.

SECOND FOLLOW-UP LETTER

THE KNOWLEDGE AVAILABILITY SYSTEMS CENTER
UNIVERSITY OF PITTSBURGH • PITTSBURGH, PENNSYLVANIA 15213 • PHONE 621-3500

March 1, 1968

Mr. John L. Roberts, President
J. L. Roberts Company, Inc.
101 Main Street
New York, New York

Dear Mr. Roberts:

When the Congress of the United States created the National Aeronautics and Space Administration under the Space Act of 1958, it obligated the agency to "...provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

NASA concentrated its information transfer function in the Office of Technology Utilization, established in 1962. This program has four basic purposes:

- To increase the return on public investment in aerospace research and development by encouraging application of findings outside of aerospace
- To shorten the time lag between aerospace discoveries and their effective use elsewhere
- To move new knowledge across disciplines, regions, industries, and markets
- To learn how best to transfer technology and to spread the use of transfer mechanisms that prove successful

The NASA data bank comprises more than 250,000 documents (unclassified) which are abstracted, indexed, and filed on computer tape by accession number and index terms. The tapes are located in regional dissemination centers (RDC's) set up by NASA to serve the civilian sector of the economy. One of these RDC's is the University of Pittsburgh.

I have already written to you about our program and how it operates. I do hope this additional effort on my part will be accepted for what it truly is--a sincere desire to be of service.

We, at the KAS Center of the University, are so enthusiastic about our work in locating and disseminating scientific information and scientific intelligence that we sometimes overlook the fact that others are not as aware as we are of the benefits already derived by so many organizations who have participated in

this experimental program during the past four years.

I am enclosing for your review a few 'sample' abstracts of recent literature accessioned by NASA. These are typical of the more than 10,000 abstracts being sent out each month to the participants in our RDC activities (of course, each participant receives only those abstracts that are relevant to his interest profiles). After reviewing the abstracts, the participants will receive 'hard' copies of each document requested.

I am also sending you a listing of the scope of literature contained in our data bank.

I do hope this information helps to further your interest in the NASA/Fitt/ Industry Technology Program. If you would care to discuss it further, I would be most happy to visit you--at no obligation--to present the program ir more detail.

Yours truly,

elw
Enc.

APPENDIX C

JAN 2 3 1968

Reactive Metals, Inc. NILES, OHIO 44446 TEL 216–652-9951 TWX 810–436-2300

January 23, 1968

Mr. William Poley
University of Pittsburgh
KAS Center
Hotel Webster Hall
Pittsburgh, Pennsylvania 15206

Dear Mr. Poley:

I would like to inform you, by means of this letter, that we are well pleased with the literature services you provide. The KAS system gives excellent coverage of our complex technology and, thereby, permits us to keep abreast of new developments and changes. Your translations of foreign articles are especially valuable to us because of their contents and because many of them are not available to us from other sources.

It is difficult to assign a monetary value to these important services since it is rare that a specific article results in direct cost savings or improvements. Instead, the literature is highly educational, helps to shape our plans, and in some cases, has clarified our thinking on technical problems. It enhances and supplements our R&D effort.

Very truly yours,

REACTIVE METALS, INC.

H. B. Bomberger

H. B. Bomberger, Manager
Research and Development

HBB:bg

Rockwell
MANUFACTURING COMPANY

THE ROCKWELL BUILDING • PITTSBURGH, PENNSYLVANIA 15208 • TELEPHONE: (412) 241-8400

January 19, 1968

Mr. James P. Miller, Ph.D.
Associate Professor of Civil Engineering
Department of Civil Engineering
325 Engineering Hall
University of Pittsburgh
Pittsburgh, Pennsylvania 15213

Dear Jim:

Received your letter of January 16 regarding the result of your checking out for us the availability of the two Russian papers that we discussed by phone. We will make arrangements to obtain a copy of the one paper from the Library of Congress as the result of your efforts.

Many thanks for tracking this down for us.

Sincerely yours,

Harry W. Fisher, Manager
Flow Measurement Engineering

HWF/djm

PITTSBURGH PLATE GLASS COMPANY/P. O. BOX 11472/PITTSBURGH, PA. 15238/AREA 412/36?-5100

JAN 23 1968

January 18, 1968

Glass Research Center
Glass Division

Mr. William Poley
University of Pittsburgh
K. A. S. Center
Hotel Webster Hall
4415 Fifth Ave.
Pittsburgh, Pa. 15213

Dear Mr. Poley:

In regard to our telephone conversation of January 9, 1968, I am pleased to inform you of the use and advantages that have been made available to us from the literature supplied in response to our question on high temperature instrumentation. At this time our experiments and tests have only been on the more simple instruments and designs as described in the literature. However, I expect that in the future we will become more proficient and knowledgeable and thus realize benefits that are now not anticipated.

The purpose for the literature search was to provide the following information:

a. State of the art technique in measuring high temperature.

b. Types of materials available for use in instruments subjected to high temperatures.

c. High temperature techniques and principles that might be adapted to our particular problems.

As mentioned before, we have only realized the initial results of the information we received. These results are primarily concerned with the design of thermocouples for use in our processes. The NASA documents and literature that you at the K.A.S. Center have filtered out have enabled us to leapfrog the expensive and time-consuming process of testing designs and materials. As of this time, the documents that have been of most

value are N67-19644 "Status of High Temperature Thermometry for the Nerva Reactor," N67-19643 "Thermocouple Development for Project Rover," and N66-17877 "High Temperature Materials Program Progress Report No. 49, Part A."

Our future plans are to continue the development of thermocouples to fulfill our process requirements of range, accuracy and life. Following the thermocouple work, we plan to investigate such items as the line reversal technique and acoustic method of temperature measurement.

Very truly yours,

A. W. Farabaugh

AWF:bjd

PITTSBURGH PLATE GLASS COMPANY/P. O. BOX 11472/PITTSBURGH, PA. 15238/AREA 412/352-5100

January 10, 1968

Glass Research Center
Glass Division

Mrs. Elizabeth Hartner
Knowledge Availability Systems Center
University of Pittsburgh
Pittsburgh, Pennsylvania 15213

Dear Betty:

The beginning of a new year usually prompts us to take stock of our facility, which includes evaluating services to our users. I thought you would like to know that the results of an informal poll indicated that our people are very well pleased with the results of their KAS searches.

All agreed that the information gained from reading the abstracts or documents which you are supplying has contributed significantly to their personal enrichment and education, has kept them abreast of work in their particular areas of interest, and has in some cases, generated ideas which have led to new approaches to problems.

One of our users says he likes to watch the trends which helps him to plan his own study programs. Another says he likes to see what others are doing experimentally with different materials and methods, and to relate these efforts to his own research project.

The engineer who is working on gas jet impingement on surfaces follows the journal literature carefully and has amassed a sizeable file on this subject. His observation is that your service makes possible a substantial contribution to theory and suggests areas of possible application in his work.

The researcher who reviews the question dealing with mathematical models for viscous fluid flow or mixing of fluids in laminar flow reports that "about 10% of the papers have immediate applicability; 40% are interesting and generate ideas; the rest are irrelevant." I consider this a gratifying statement, as his work pertains to the development of a technology which is considered extremely important here at the laboratory.

The chemist who reviews the feedout on "Synthesis of polybenzimidazoles and/or polyimides" expressed himself thus: "A basic research program absolutely requires much literature searching. My particular research problem is of a very special nature and in a field of chemistry that has only developed since about 1961, thus

available literature is scarce and probably widely scattered, making computer searching particularly necessary . . . the abstract of N67-36605 sounds like it might contain some very vital information . . . N67-36605 deals with a somewhat different polymer system than I am working on, but very possibly forms intermediates that are very similar . . . " He goes on to say that an important Russian paper relative to chemical reaction conditions was retrieved by the Center for Information Services, another searching system we use. We searched this question in Chemical Abstracts as well, Betty. I guess this experience should strengthen our knowledge that no single information bank should be solely relied upon for thorough literature coverage.

Concerning your system's services, I was well pleased with the response I had, and hope that you and the rest of the staff at the KAS Center will feel gratified for the many hours and careful attention you have given our work.

May 1968 be a rewarding year for all of you.

Sincerely,

Jane Bookmyer

Jane Bookmyer
Research Planning and
Information Services Division

JB:dkr
cc: Allen Kent

semi-elements, inc.—
Saxonburg Boulevard, Saxonburg, Pa. 16056
Phone: 412-352-1548
TELEX 086-850

January 8, 1968

Dr. James Miller
University of Pittsburgh
320 Engineering Hall
Pittsburgh, Pennsylvania 15213

Dear Dr. Miller:

As you know, we make extensive use of the documents provided by the "Knowledge Availability Systems Center". Occasionally, only specific data such as lattice parameters or melting point information is utilized. In other cases, the entire report is carefully scrutinized. Since some customers specifically mention certain reports as a basis for their own experiments, the very presence or lack of that report could mean the difference between an order or not.

Since Semi-Elements manufactures over 300 different kind of crystals as well as plastic scintillators, high purity chemicals and specialty alloys, the reports provide the necessary technical data to maintain our posiiton in this field.

Reports which I have found particularly useful are:

NASA TND - 3775 - Question 10811 - Electro-Optic and Magneto-Optic Modulators
N67-15017 - 10809 - Fine Structure in the Absorption Spectra of $KMnF_3$ and $RbMnF_3$
A67-16975 - Question 10807 - Ruby Crystals Grown by the Czochralski Technique
N65-30646 - Question 10807 - Physical Properties of UO_2 Single Crystals
N64-12561 - Question 10807 (N64-12559 - The Laser
A67-15320 - Question 10807 - Al_2O_3 Single Crystal Growth by Electron Beam
A67-12813 - Question 10807 - Edge Emission in CdS as Internal Radiative Transition
N66-11246 - Question 10808 - Development of Improved Single Crystal Gallium Phosphide Solar Cells

Admittedly, I could be more specific and provide you with additional information on the value of the program, but unfortunately, time does not permit this.

We do, however, appreciate your co-operation in all areas associated with the program and hope that we can continue to avail ourselves of this service.

Very truly yours,

SEMI-ELEMENTS, INC.

Joseph Barrett
Operations Manager

JB

World's Largest Supplier of Single Crystals

OCT 30 1967

SOUTHWEST RESEARCH INSTITUTE
8500 CULEBRA ROAD SAN ANTONIO, TEXAS 78206

27 October 1967

Mr. Ed Phillips
The Knowledge Availability Systems Center
The University of Pittsburgh
Pittsburgh, Pennsylvania 15213

Dear Mr. Phillips:

I have consulted Dr. Ware on the three questions which I had some doubt about in our telephone conversation of 25 October regarding the search for technology applicable to blood recirculation.

1. As to whether collapsing bubbles is sufficient or whether degassing is required: the breaking up of bubbles would not constitute an adequate solution to the control problems at the intake point. It is desired to minimize the air/bubble interface because bubbles cause lysing of red blood cells: breaking up of gas bubbles would increase the surface to volume ratio of the aspirated air and this is undesirable. Ways are therefore desired for minimizing intake of air into the system to begin with.

2. In the problems of switching flow from bottle to bottle, it is desired to perform this function with minimum trauma to the blood.

3. The use of ionizing radiation to detect the liquid/liquid interface is not ruled out completely, although other methods such as the acoustic waves or optical techniques, which you mentioned as possibilities, on the basis of minimizing radiation damage to the blood. Should particularly attractive low-level radiation schemes be uncovered during the search, they ought to be included in the search abstracts for completeness. If possible, during your screening of the material, please flag these radiation techniques for convenience of the researcher's scanning of the search results.

May I remind you also that we would very much appreciate receiving the document on sonic measurement of bone mass (N66-17679) which we spoke about in our telephone conversation.

I enjoyed discussing the search problems with you, and am looking forward to an interesting yield on this problem. I am writing Mr. Howie a letter to pass on to him several highly complimentary reactions of the search users to the last few searches which you have done for us. It appears that the additional communication which we engage in prior to actual searching is beginning to pay off, and I wanted to express my appreciation to you.

Sincerely yours,

Louis S. Berger
Assistant Director
Biomedical Applications Team

LSB:wbs
c.c. Dr. Quentin Hartwig

UNIVERSITY OF PITTSBURGH

SCHOOL OF ENGINEERING

PITTSBURGH, PENNSYLVANIA 15213

DEPARTMENT OF
LECTRICAL ENGINEERING

Phone: 412—621-3500

November 20, 1967

Mrs. H. E. Hartner
Manager Information Analysis
KAS Center
Hotel Webster Hall
University of Pittsburgh

Dear Mrs. Hartner:

I wish to take this opportunity to express the appreciation of the Electrical Engineering Department for the time, information, and advice you have given to the students in our Senior Design Course. The many aspects involved in the design of an internal hearing device and power supply could not have been as thoroughly studied and presented by the class without your assistance.

This was the first attempt to have the Design Class undertake a bio-medical project and I feel that they have done a very fine piece of work considering that none of the class members had ever been involved with any ear problems. Classroom lectures can only provide a portion of the necessary training, the remainder coming from contact with the problems, discussions with persons well versed in the area; and technical information supplied in report form. Cooperation such as you have shown is very much appreciated by students and faculty alike and is very encouraging to us in our educational endeavors to produce a better engineering graduate.

I shall send you a complete copy of the final report of this project containing the individual designs of each of the groups in the design course. This report is now being typed and should be completed in mid-December 1967.

I would also like to offer my personal thanks for your cooperation since I am responsible for the design course and cooperation such as yours provides for better design projects.

Sincerely yours,

Ronald G. Schultz

Dr. Ronald G. Schultz
Associate Professor of
Electrical Engineering

RGS:pw

THE KNOWLEDGE AVAILABILITY SYSTEMS CENTER
UNIVERSITY OF PITTSBURGH • PITTSBURGH, PENNSYLVANIA 15213 • PHONE 621-3500

MEMORANDUM

TO: Dr. A. G. Holzman

FROM: William Poley

DATE: January 12, 1968

I have contacted Dr. Bomberger of Reactive Metals, Inc., regarding possible transfers. He was unable to cite any specific transfers, but did state that the service was very helpful in their research programs. He stated he would write a letter to that effect.

Another contact was Mr. Al Sarabaugh (of PPG) regarding, specifically, Question No. 11985, "Techniques for Measuring Temperatures Between 3500° and 4200°F." Mr. Sarabaugh also cited the usefulness of the KAS service in their research programs. In addition, he did state that he was involved in one project at the present time which might prove out to be a 'direct' transfer. I requested a letter from him both concerning his general feelings about the service, and whatever he could say at the present time regarding this project of his. He said he would write one, and at least at some future date send us a copy of a report on this project.

I have also been trying to contact Mr. Richard Webster of J & L (an Assistant Direct involved with their instrumentation program). Hope to finally accomplish this later this afternoon. According to the librarian, Mrs. H. Gillespie, Mr. Webster is an enthusiastic user of the service. I will contact you later if anything results from this contact.

UNIVERSITY OF PITTSBURGH

DEPARTMENT OF CIVIL ENGINEERING

325 ENGINEERING HALL

PITTSBURGH, PENNSYLVANIA 15213

: A. G. Holzman

)M: James P. Miller

TE: January 15, 1968

)JECT: NASA

I made a telephone call to Mr. George Morin, Johnson & Johnson Company, New Brunswick, N. J., on January 11, 1968. Mr. Morin informed me that they were very happy with our NASA service, and he would check with the users to see if they would pinpoint any specific spin-offs.

I received a return telephone call from him on Friday, January 12, 1968, at which time he informed me that he had contacted other members using our service and had found no one that could document any specific transfer of information.

On the 10th of January I talked to Mr. Harry Fisher at Rockwell Company, concerning their questions #11504 and #10887. The first one concerns Gas Density Measurements; and the second, Application to Fluid Devices to Metering.

He said that our service had been very valuable to him in an indirect way and he felt that it kept him and the Company from being caught behind the times. He mentioned document NASA reproduction #N67-16862, concerning Analysis of Self Oscillations in Pneumatic Regulators. He felt that this had been one of the most useful and valuable documents that he had received, but there had been no direct spin-off.

I also talked the same day to Mr. Albert Pool, concerning Question #10891, on Optimum Design of Valves. Mr. Pool's statement was that he felt he received no "golden nuggets" of information, but found the service to be very useful and was satisfied with it and wished the question to be continued as is.

I gave you the letter that I received from Semi-Elements. They did document some of the abstracts that they had used this last year.

THE KNOWLEDGE AVAILABILITY SYSTEMS CENTER
UNIVERSITY OF PITTSBURGH • PITTSBURGH, PENNSYLVANIA 15213 • PHONE 621-3500

MEMORANDUM

TO: Dr. Holzman

FROM: Betty Hartner

DATE: January 16, 1968

SUBJECT: Transfer

A further response from U.S. Steel in regard to technology transfer was received today from Frances Poremba, Head Librarian, and the recipient of search results destined for the Edgar C. Bain Fundamental Research Laboratory.

Her questioners are well pleased with the service, although the documents covered are more experimental than theoretical. They find the speed of notification excellent, especially in the reporting of University research, supported by governmental agency contract, - as much as 6 months to a year ahead of other abstracting journals. While for most questions our coverage is not complete, (i.e. to make a complete literature survey it is necessary to cover other journals), still for one search 25% of the citations were not revealed by any other journal. They are also pleased by the good coverage of Russian and other journals not ordinarily seen.

cc: E. Howie

EPH/jn

THE KNOWLEDGE AVAILABILITY SYSTEMS CENTER
UNIVERSITY OF PITTSBURGH • PITTSBURGH, PENNSYLVANIA 15213 • PHONE 621-3500

MEMORANDUM

TO: Dr. Holzman

FROM: Lily El Hadidy

DATE: January 16, 1968

SUBJECT: Transfer

Summary of telephone conversation with Mr. Jerry Seiner, of Coatings & Resins Division, Pittsburgh Plate Glass, January 16, 1968.

Information with regard to the following questions had direct application or were directly useful:

Questions
1. Reflective Organic Coatings
2. Curing of paints & films by radiation
3. Polymer electrodeposition
4. Photochromism, Phototropism or color reversible reactions NASA SP64-5014

Information related to following questions had indirect application.

Questions 5. Copolymerization Kinetics.

The data in the documents sent have been useful to their particular research problem.

6. Loss-tangent-monomer

Document N67-18046 was sent. Question subject was discussed marginally, but the document mainly discussed the effect of space environment on coating materials which lead to a change of interest by the client.

According to Mr. Seiner, he does not have the no. of documents that have been used off hand, this means he will have to check with his people for this information which he hesitated to do.

UNIVERSITY OF PITTSBURGH

SCHOOL OF ENGINEERING

SCHOOL OF MINES

DEPARTMENT OF
ELECTRICAL ENGINEERING

TO: Dr. A. G. Holzman

FROM: T. W. Sze TWS

DATE: January 12, 1968

SUBJECT: Schroeder Brothers

I have contacted Mr. Henry Barthe of Schroeder Brothers, Inc. and discussed re-phrasing of their question. It seems that they are quite happy about the coverage of the old question, so he is only requesting that they get all the outputs, pertinent and non-pertinent abstracts. I pointed out to him that at the request of Mr. Schroeder we have done exactly that for the last four months. So, the result of the telephone conversation is that there should be no change of phrasing of question, no change of handling of abstracts, and continue with the present arrangement.

I also inquired about the "technical knowledge transfer" effectiveness of the program. Here is some points of our conversation.

1. The first year output was specially productive in their point of view. In two occasions, the materials prevented them from going into rather costly venture.

2. The second year output has been less productive. This is mainly because the first year output contained backlog information backdated several years, while the second year outputs were mainly current awareness search. Mr. Barthe thinks even so the materials have been great help as the background material for their general field.

cc: Mr. Howie

Memorandum

To : Dr. Holzman

From : Betty Hartner

Date : January 11, 1968

Subject: Transfers

In response to your request for evidence of technology transfer I have contacted representatives of several companies. The companies contacted make use of our information in relation to their research activities. All were enthusiastic, made comments in relation to specific profiles, but did not cite any direct 1 to 1 transfers.

The lack of transfer results from the nature of research, leading to the following quotes:

1. "mathematical modeling of flow" - documents pertinent and of interest - 10% directly applicable to the problem. PPG
2. document discussing a polymer. Project absolutely requires this information. PPG
3. air impingement question. Material educational for pursuit of this research. PPG
4. One research group glad to have records of parallel failures in experimental procedures leading to a hoped for end result. PPG
5. Reports of new instrumentation and devices justify without question continuation of service. J & L
6. Subscribe to tech briefs, but KASC coverage is better and like to have them tied in to specific profiles. J&L
7. Of 11 documents requested and read, 4 or 5 directly bear on the solution of a particular problem. U.S. Bur. Mines
8. Impossible to cover all journal articles. Abstracts help to keep well informed, even when authors known. Mutual problems maybe discussed, on face to face meeting, but perusal of published material necessary to keep up with what is going on. Information gleared from literature used to modify, change emphasis of, procedures for making microprobe studies. U.S. Steel

In relation to research, the best chance of direct transfer lies in the field of analysis and testing. Further feelers can be made in this direction, but transfer would not be as interesting from a publicity standpoint as "walkers" etc.

Mrs. Bookmyer (PPG) will send a letter substantiating the above. Mr. Felkner (U.S.S.) will also investigate the matter and let us know.

cc: E. Howie

UNIVERSITY OF PITTSBURGH
PITTSBURGH, PENNSYLVANIA 15213

School of Engineering

MEMORANDUM

TO: A. G. Holzman

FROM: H. E. Trout, Jr.

DATE: January 9, 1968

RE: NASA Site Inspection

I have talked with ALCO Products, Inc. Mr. Huchette, during the conversation, volunteered the information that the question on reinforced plastics was the "best source of information he has seen on the subject." One article on reinforced plastic springs had been of great interest to them, as they were working toward the development of reinforced plastic springs as well as other engineering structures. This conversation was on January 4, 1968.

Several months earlier, I talked with Mr. Cachat of Ohio Crankshaft, and he mentioned that they had secured a very good lead in the area of high temperature electrical insulation but did not expand on it as the matter was one of proprietary interest to TOCCO for use in some of their products.

UNIVERSITY OF PITTSBURGH
DEPARTMENT OF MECHANICAL ENGINEERING
222-223 ENGINEERING HALL
PITTSBURGH 13, PA.

TO: Dr. A. G. Holzman

FROM: Dr. G. E. Geiger

DATE: January 15, 1968

SUBJECT: Transfers - Vertol Division, Boeing Company

I talked to Mrs. L. M. Rankin, Librarian of the Vertol Division, by telephone on January 12, 1968. In this conversation, she stated that the KAS service has been excellently received, and the recipients are most enthusiastic about the service. She explained that this did cause a problem since most of the material is disseminated throughout the division and that on a number of occasions they need two or more copies of a document. They do have reproduction facilities, but since a good many of the documents are fairly poor reproductions themselves, they cannot be reproduced.

As to actual transfers, she said that there have been a number of instances where the information supplied by KAS has been used most effectively. The latest involved a survey of short-haul transportation systems, in which design decisions concerning helicopter and STOL aircraft were involved. Here she said the information received proved very valuable.

She also said that a possible new service that KAS might offer is a yearly bound bibliography of the various questions. Since the retrospective and current awareness searches are immediately distributed and circulated and used so extensively, the complete set of abstracts no longer exists in one location. On a number of occasions, she said, requests have come to her for such a complete set many months after it has been circulated.

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THE KNOWLEDGE AVAILABILITY SYSTEMS CENTER
UNIVERSITY OF PITTSBURGH • PITTSBURGH, PENNSYLVANIA 15213 • PHONE

MEMORANDUM

TO: Dr. A. G. Holzman

FROM: W. A. Poley

DATE: January 15, 1968

SUBJECT: Technology transfer and J & L Steel

A telephone conversation was conducted on January 12 with Mr. Richard Webster, an Assistant Director in the area of instrumentation at J & L Steel Corporation. Mr. Webster is an enthusiastic booster of the service provided by the KAS Center, and stated that the material obtained from us has been of far more value than that from other sources. He stated that he is one of the primary reasons that J & L is still a customer of the KAS Center, due to his satisfaction with material received.

Specifically, Mr. Webster was contacted concerning possible transfers on question no. 10366: "Ultrasonic and Electromagnetic NDT Methods for Pipe and Tubing." While he could not cite any direct transfers per se, Mr. Webster did give a few examples of how our service has helped them. For instance, J & L had been obtaining anomolous results using ultrasonics in some NDT applications. Reasons for this were not known until some materials were received dealing with investigations of frequency generation in ultrasonic equipment at Watertown Arsenal. It was found that vendor-quoted specifications for ultrasonic equipment were sometimes way off from the actual output frequencies being generated. J & L now looks quite closely at vendor claims regarding such equipment. Other materials furnished them has affected J & L research plans. Mr. Webster cited material received dealing with electromagnetic methods that tie in quite closely with research being done by J & L on eddy-current techniques.

Mr. Webster stated that he would furnish us with a letter concerning how the KAS service has been of use to them and how well he likes it.

W. A. Poley

TO: Dr. A. G. Holzman

FROM: M. A. Gratton

DATE: January 15, 1968

SUBJECT: Documentation in the NASA Program

Mr. Joseph Walsh of Newcomer Products, Inc. presentec a very favorable view of the value of the NASA program. He states that although there have been no direct transfers from the literature reviewed, the service has more than paid for itself. Among the reasons he gives for his enthusiasm are the following:

1. In general it provides him with a vast source of ideas. He says that it has helped him to be more selective in his choice of research subjects. He indicated that as a result of the program, research money has been spent profitably in areas where, on the surface, it would not seem justified.

2. Studies of the methods by which others attack parallel projects have aided his staff in solving their problems thus saving both time and money.

3. Some of the basic information that he has been receiving (particularly Russian) is very broadening and has provided leads which have helped in solving some of their problems.

4. In the field of metal powder preparation information obtained on milling media, etc. has helped him to improve control of particle size and purity of product.