NASA TM X-57001

NASA SELECTIVE DISSEMINATION OF INFORMATION PROGRAM

(IBM 7090/94 SYSTEM)

By Gifford A. Young

Information Systems and Development Branch
Scientific and Technical Information Division
National Aeronautics and Space Administration
Washington, D.C.

June 1966

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ABSTRACT

Announcement and distribution of documents through an automated selective dissemination of information (SDI) system is a response to the rapid growth of the literature as well as the growth of scientific and engineering staffs. NASA's developmental SDI Program, operating under an IBM 7090/94 computer system, was initially developed under contract by IBM Advanced Systems Development Division and then transferred to operation by NASA's Scientific and Technical Information Facility. Over 2000 documents, the full contents of Scientific and Technical Aerospace Reports and International Aerospace Abstracts, are compared twice monthly with the expressed interests of over 700 participants, located at 10 NASA and 11 Air Force centers. Exceptional flexibility is possible in expressing user interests; match options include "must" single-word descriptors, two- to seven-word phrases, "not" terms and phrases, and percentage (or "may" word) matching, plus a number of special descriptors, such as contract numbers. In preparing the input document and user interest profiles for matching, a dictionary program provides machine-generated codes and can substitute cross-referenced descriptors. The computer configuration requires an IBM 7090/94 with 32K storage, two IBM 7607 data channels, and eight IBM 729 tape drives. System output consists of tab-card-sized abstract cards duplicating the high graphic arts quality of photocomposed journal abstracts. A response card provides for expression of interest by manual punchout and may be used to request the full text of selected documents. Development of the computer program and its exploratory operation are described in report NASA CR-62020. Program documentation is given in NASA CR-62021. In the present report, operating experience under NASA direction is presented, program modifications are described, and availability of the program is discussed. In February 1966, the 7090/94 SDI program was replaced by an IBM 1410 program with planned emulation on an IBM Systems/360 Model 40.

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SECTION 1. SUMMARY

Selective dissemination of information (SDI) makes use of the capabilities of computers to manage on one hand the accelerating growth of information and on the other the corresponding need of scientific and engineering staffs for selected portions of this information. For SDI, computers are programmed to compare the subject indexes of documents against the expressed interests of participants in an SDI system in order to select appropriate documents for announcement or direct distribution. The NASA SDI program (IBM 7090/94 system) described in this report is capable of matching the interests of large numbers of users against the contents of large volumes of announcements. It permits user interests to be expressed with flexibility and precision, and provides notifications of selected documents in the form of exceptionally legible and convenient announcements.

Primary hardware required includes an IBM 7090/94 data processing system with 32K storage, two 7607 data channels, and eight 729 tape drives.

The program was developed under contract to NASA by IBM Advanced Systems Development Division during the period of June 1963 through December 1964.

A description of the system in effect as of December 1964 is given in the following reports:

> International Business Machines Corp., Yorktown Heights, New York
> Implementation, Test and Evaluation of a Selective Dissemination System for NASA Scientific and Technical Information. Final Report.
> **Jun 1966, 83 pp. (Price $2.50)**
> (NASA CR-62020)
>
> International Business Machines Corp., Yorktown Heights, New York
> Program Documentation for a Selective Dissemination of Information System for NASA Scientific and Technical Information.
> **Jun 1966, 223 pp. (Price $3.75)**
> (NASA CR-62021)

Flow charts and operating instructions are given in the second of these reports.

The program was operated by the NASA Scientific and Technical Information

Facility, College Park, Md., under the technical direction of the NASA Scientific and Technical Information Division during a transition period from September to December 1964, and was fully operable from January 1965 to February 1966. During this period, significant changes in the operations were made on the basis of experience and user requests. These changes are discussed in the appropriate sections of this report.

The present report is addressed primarily to organizations or individuals contemplating operation of the system independently. This report:

- Presents essential information not given in the IBM final report and documentation; for example, off-line programs for preparing operating reports.
- Relates experience gained in actual operation of the system.
- Documents changes that were made in the program between the completion of the IBM final report and the transfer of SDI operations to another computer system.
- Advises on preparation of effective user interest profiles.
- Relates library experience in handling SDI-generated requests for documents.
- Suggests potential changes in operation and output media that an independent operator might wish to put into effect.

The 7090/94 NASA SDI profile transaction and match programs described in NASA CR-62020 and NASA CR-62021 can be obtained from NASA by special arrangement. Associated off-line 1401/1410 programs for printing user accessions, document profiles, etc., also can be supplied.

In February 1966, the NASA SDI program was reoriented to take advantage of the availability for SDI operations of a different computer, an IBM 1410, and to prepare for the installation in the near future of an IBM Systems/360 with 1410 emulator hardware. A bibliographic retrieval-SDI program written for an IBM 1410 with 40K memory and process overlap and priority features was demonstrated to work effectively; therefore the 7090/94 program was inactivated.

Further information about the NASA 7090/94 and 1410 SDI programs and other NASA technical information services may be obtained by writing to:

Scientific and Technical Information Division
Code USD
National Aeronautics and Space Administration
Washington, D. C. 20546

SECTION 2. INTRODUCTION

One of today's great problems in science and technology is the tremendous outpouring of literature concerning new discoveries and developments. The flood of reports is compounded by the gradual elimination of sharp distinctions between disciplines; today's scientist or engineer must be alert for related developments in fields other than his own. The traditional way of keeping informed, by simply reading the literature, is no longer practicable. The individual who depended on his own examination of the vast paper avalanche would have no time for anything else.

For a number of years, a partial solution has been the publication of abstract journals which enable the individual to scan summaries of the current literature and to select for detailed reading only those documents of clear value to his work. The abstract journal is still a basic resource, but the flow of information is rapidly reaching a point where scanning abstract journals for current awareness is a time consuming and often neglected chore.

NASA's Selective Dissemination of Information (SDI) program is an approach to solving the literature problem by automatically notifying NASA scientists and engineers individually of new reports of value in their work (Fig. 1). Its success has been made possible by evolving computer capabilities to select and deliver relevant information effectively and economically.

Although the mechanics of NASA SDI (IBM 7090/94 system) involve a large computer, the program provides a personalized service. A participant in the NASA SDI program receives daily at his desk a few envelopes, each containing two tab-sized cards, as illustrated in figure 2. One of these cards carries a citation and abstract of a report or journal article selected by a computer by comparing an "interest profile" written by the participant with the subject indexes of all the literature entering the system in the past two weeks. This abstract card, which is on white paper for good legibility, can be filed for future reference either as a tab card or, since it has a perforated stub that is easy to tear off, as a standard 3 x 5 inch file card.

The other card, on blue stock, facilitates a response to the system. It has prescored blanks that may be punched out with a pencil point to indicate (1) that the document is of interest and that the participant wishes to see it; or (2) that it is of interest, but that he does not want a copy at the present time; or (3) that he has seen it before; or (4) that it is not of interest. (The abstract and response cards are illustrated individually and described in detail in Section 7.)

A "comments" space permits the participant to advise the system operator to change his address, rewrite part of his interest profile, or suggest any changes that he thinks would improve the system. The user is an integral part of the NASA SDI system; significant improvements have come about from such user feedback and comments.

The NASA SDI system is extensive both in input, which includes essentially all the world's unclassified aerospace literature, and in the geographical distribution of its present 700 participants, who are located at 21 research centers throughout the United States. How NASA came to develop such a system can best be introduced by describing briefly NASA's overall scientific and technical information activities, with which SDI is closely integrated.

The Space Act of 1958, Public Law 85-568, which created the National Aeronautics and Space Administration, laid out NASA's technical information job in very broad terms: To publish and disseminate widely the results of NASA research activities and findings. This is done through large-scale publication and distribution of NASA in-house (technical notes, technical memorandums, and translations) and contractor technical reports. "Repackaging" of scientific and technical information is also a major activity. This includes the issuance of project summaries, data compilations, handbooks, sourcebooks, monographs, technical reviews, state-of-the-art surveys, special bibliographies, and literature surveys. Spin-off of aerospace developments of value to non-aerospace industry is encouraged through a technology utilization program which, as part of its activities, issues technology surveys, reports, notes, and NASA Tech Briefs. NASA also has the responsibility of providing worldwide research results of aerospace interest and significance to its scientists and engineers and contractors. To accomplish this, the Agency conducts an aggressive program to acquire the world's aerospace literature, to bring it under bibliographic control, and to announce and disseminate it in the shortest possible time to those who need the information.

To carry out this mission, NASA has established the NASA Scientific and Technical Information Facility, operated by Documentation Incorporated under the technical directions of NASA's Scientific and Technical Information Division. The Facility acquires the aerospace report literature, processes it into various eye-legible microdocumented, or machine-readable forms, and announces it in a semimonthly abstract journal, Scientific and Technical Aerospace Reports (STAR).

Similarly, the American Institute of Aeronautics and Astronautics, New York City, by a cooperative arrangement with NASA, acquires the world's formally published aerospace literature--that appearing in journals, books, and conferences. AIAA processes this information in the same manner that NASA's Facility processes the report literature, and announces it semimonthly in an abstract journal, International Aerospace Abstracts (IAA). Citations and indexes of all announcements in both STAR and IAA are also distributed on machine-readable tapes to NASA research laboratories and major NASA research and development contractors.

Each semimonthly issue of STAR and IAA contains more than 1000 abstracts. During calendar year 1965, the two journals together announced in excess of 50,000 items. To meet the information needs of the busy scientist and engineer, it would clearly be desirable to bring to his attention only the relatively few announcements that

are related specifically to his interests. Fortunately, all the necessary ingredients for such selection--except the computer program--become available as part of the normal production of STAR and IAA and related bibliographic and information services: abstracts, indexes, tapes, and full texts of announced documents.

In 1963, a proposal was made to NASA's Scientific and Technical Information Division by IBM's Advanced Systems Development Division, Yorktown Heights, New York, to conduct a developmental study of an advanced, large-scale SDI system that would take advantage of the speed and memory capacity of an IBM 7090/94 computer. As finally accepted, this study involved the selection of announcements from STAR only, the participation of 500 NASA scientists and enginers located at NASA Headquarters and eight (now ten) research centers, a ten-months' test of the system (November 1964 to August 1964), and four months' evaluation (September to December 1964).

During this time, changes were continually being made in the selection techniques, either as experiments or as the computer programmers added new features. As might be expected, this caused the number of announcements and their relevance to vary sharply. Yet the participants came more and more to accept SDI as a satisfactory information service, some of them even abandoning the use of the abstract journals and depending on SDI exclusively.

In June 1964, the membership increased when the U. S. Air Force asked to add 200 of its personnel to the NASA program for several months to gain experience with an operating system. Interest has been so high that this participation has continued to the present. These 200 Air Force engineers, scientists, and administrators are located at 11 U. S. Air Force bases and research centers.

As the developmental contract with IBM's Advanced Systems Development Division was to terminate December 31, 1964, transfer of SDI operations to the NASA Scientific and Technical Information Facility took place during September to December 1964. During this period and during its subsequent independent operation of the 7090/94 program, the Facility continued to provide service to about 700 users. A number of changes were made in the program at NASA direction. These are discussed in the following sections of this report.

A change of particular note occurred when searching of the full contents of IAA was initiated in November 1964. This doubled the literature input to the system and the number of announcements selected and forwarded to participants created additional pressure on library staffs, especially since the new announcements were journal articles, books, and conference papers--documents less easily accessioned and distributed than reports. However, it has benefitted the individual user in broadening the scope of items selected for him.

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Program reorientation. All aspects of the program described in this report have been under continuous evaluation, with full recognition that effective operation of

the NASA SDI program is not restricted to a particular computer configuration, nor to a particular form of announcement. Operation and further development of the program, which is based on an IBM 7090/94 program written during 1963 and early 1964, has taken place during a period of rapid changes in computer technology. New series of computers are being installed widely; of particular relevance, NASA's Facility is preparing to install an IBM Systems/360 Model 40 in July 1966.

On the basis of the directions being taken by computer technology and consideration of the practicality of in-house operation of the program, a decision was made in late 1965 to replace the IBM 7090/94 SDI program with one intended to operate on the IBM Systems/360 Model 40. In further consideration of the desirability of immediate transfer of operations to gain more convenient operator control of the program -- the IBM 7090/94 program required the cooperation of a NASA research center for the availability of time on an IBM 7094 computer that is usually fully occupied with scientific and technical computations -- it was decided to convert as soon as possible to an SDI program written for an IBM 1410 computer. This computer was more readily available than the IBM 7094. Emulator hardware for the IBM 1410 will be installed on the planned IBM Systems/360 computer. A bibliographic search program written for an IBM 1410 with 40K memory and process overlap and priority features was modified for SDI use. The revised program was demonstrated to work effectively; therefore, the 7090/94 program was inactivated in February 1966.

The 7090/94 program will be made available on request to organizations interested in studying this particular SDI system. The programs, documentation, and associated 1401 and 1410 programs described in this report can be supplied by special arrangement with NASA. Program maintenance would be the responsibility of any organization receiving it and no guarantee concerning its operation can be made.

In addition to the conversion of computer operations to a different computer, the form of the SDI announcement has also been changed. Users of the NASA SDI service now receive a computer printed listing of citations rather than the abstract cards described in this report. The current NASA SDI program thus differs from that described in this document and in the associated reports NASA CR-62020 and NASA CR-62021. These three reports are published as a record of a unique SDI system and a stage in the development of selective dissemination of information systems.

SECTION 3. DOCUMENT PROFILES

The NASA SDI system matches representations of participants' interests (user profiles) against representations of the subject content of reports and published literature (document profiles). The format in which the document profiles enter the system is a critical factor in programming and operating the system. For projected independent operation of NASA SDI systems, knowledge of the identifiers, document codes, and descriptive cataloging details that appear on the input tape is essential for understanding the selection options available to an SDI operator. (The document representation used in the match program comprises only a portion of the full input information concerning each document.) Detailed awareness of the document input contributes to (1) understanding the operation of the NASA SDI program and (2) possible modifying the program to suit specific interests.

Input file format. Document input is a computer tape having a linear file format and containing full citation and indexing (but not abstracts) of all documents that have been selected for appearance in the next forthcoming issues of STAR and IAA.

No information concerning document profile input is given in the IBM program documentation, which states only: "This file is provided via other NASA operations from which its format can be obtained," (NASA CR-62021, p. 12). The document tape format is presented in full in the following publication:

Guide to the Processing, Storage, and Retrieval of Bibliographic Information at the NASA Scientific and Technical Information Facility
June 1966 149 pp. (Price $3.25)
(NASA CR-62033)

The document tape has been formatted primarily for use with the variable-length-field IBM 1401 and 1410 computers; therefore, the input tapes as distributed by the NASA Facility require reformatting for use with an IBM 7090/94 computer. The program is available as part of the NASA SDI package.

Document profile processing. The document input tape is processed by a subroutine GTDOC, which is flow-charted in NASA CR-62021, pp. 52-7. During operation of the program, the processing of the title field and the personal author field described in the latter were deleted.

Initially, the title field (actually the first line, equal to 50 characters or less, of the document title) and the personal author field on the tape were extracted by GTDOC, coded, and added to the dictionary. The truncated title (in effect a multiword phrase which frequently contained articles, prepositions, and odd combinations of numbers, acronyms, etc.) and the personal authors (at that time treated as a two- or three-word phase consisting of surname and initials) were then able to match against user profiles and generate announcements.

Matching against a truncated title was intended to permit a possibly valid hit that could not have occurred by a match against index descriptors alone. This concept was related to the philosophy of entering user profiles in the user's unedited words. In order to eliminate some commonly used words having no information content yet adding to length of phrases and possibly permitting false matches, the following 44 articles and prepositions were automatically eliminated from both document and user profiles (NASA CR-62021, p. 40).

a	as	like	round
about	at	near	since
above	back	of	the
after	below	off	to
ahead	but	on	under
along	by	onto	until
amid	down	or	unto
among	for	out	up
an	from	over	upon
and	in	past	via
apart	into	per	with

A few of these words can appear in meaningful expressions (e.g., back injury, near infrared) so that their rejection could lead to occasional "misses."

The concept of truncated titles was dropped as an unnecessary complication and as being inconsistent with the policy of using a controlled vocabulary in writing user interest profiles. It is described here only to document the discrepancy between the description of GTDOC in NASA CR-62021 and the actual program. It will also suggest the flexibility of the program; titles and other fields on the linear file could be entered as match possibilities by operators of independent or decentralized systems.

The names and initials of personal authors at one time were matched as if they were subject descriptors, as mentioned in a preceding paragraph. This resulted in curious false matches, such as announcement of a totally nonrelevant report to a meteorologist because the report author's name was Snow, or an equally meaningless announcement to a profile on machining because one of the authors had the name Hammer. Because of lack of interest, and to save computer time during the MATCH program, selection on author's names was dropped from the 7090/94 NASA SDI operation. It could easily be reinstated if desired. If personal authors were to be reincluded as match options, their names would be concatenated in the manner described in NASA CR-62020, p. 14, as the computer program has been modified.

Indexing practices. Effectiveness in matching documents against user profiles ultimately is dependent on the subject index terms making up the document profile. The index terms assigned to documents are assigned for another purpose than SDI; namely, bibliographic retrieval. Indexing is done in conjunction with abstracting. Ten to twenty

subject terms are assigned to each report by trained literature analysts. The index terms then are written on magnetic tapes.

Index terms are referred to as either "machine terms" or "published terms." The latter are those that appear in the book-type index that is published in each issue of STAR and IAA and is cumulated quarterly and annually. The other index terms are used only in bibliographic searching by a machine (computer). Of the ten to 20 index terms assigned to a document, only three or four will be used as published terms. Another distinction is that published terms are frequently multiword descriptors, while machine terms are commonly single words.

In assigning index terms, indexers are restricted to a controlled vocabulary which may be changed only by approval of a vocabulary edit group. This vocabulary consists at present of about 19,000 machine and published terms combined.

Reports and journal literature are indexed according to the same standards and the same vocabulary, although processed by different organizations. For both areas, citation tapes having identical formats are prepared and distributed. The full range of aerospace literature found in STAR and IAA therefore is available in machine readable form.

The operator of an independent SDI system will frequently have reason to examine the indexing assigned to documents, particularly in reviewing the announcements received by a participant. A printout of all indexing terms that took part in the match of a given issue is provided by a 1401 print program from a tape obtained during the 7090/94 computer run. This document profile printout is described in Section 6. The following comments on indexing practices will help explain the contents of the document profiles:

A number of common adjectives, such as high and low, are always precoordinated with the terms they modify. Proper names, in such expressions as Einstein law, and naturally combining forms, such as Mariner II Spacecraft, also are precoordinated. Otherwise, all words in the phrases listed should also appear as separate words in the document profile, indicating that they are also assigned as machine terms as well as published terms. Practice varies to some extent, however. For example, an adjectival form in a phrase might occur as a noun form in a machine term: e.g., Magnetic effect and Magnetism. Usually, both Electric stimulus and Electric, not Electricity, will appear in this printout.

The distinction between machine terms and published terms is not meaningful in the 7090/94 SDI program. All descriptors--machine, precoordinated, or published--are disassociated into their unit word components. In reviewing the document profile printout, it is important to recognize that matches can result from combinations of any words in a profile, whether a word appears singly or as a component of a multiword descriptor.

Index terms are assigned in the singular unless the plural form is significantly different in meaning; e. g., plastic and plastics are separate index terms.

Hyphenated descriptors are concatenated by the computer and treated as single words. About 450 hyphenated expressions are found in the machine term vocabulary. These include such combinations as all-weather, Baker-Nunn, B-70, etc. The component parts of hyphenated expressions cannot match by themselves; e.g., the word weather in a profile cannot be matched in any way to the word all-weather.

Such expressions as M- 1 (note space) are not treated as hyphenated. Their presence is the result of allotting several digits to allow for future growth in series designations. In writing profiles, the system operator should be careful that such expressions in the user's profile correspond exactly to the machine term vocabulary. An M-1 in a user profile will not match an M- 1 in a document profile.

Depth of indexing

The number of index terms is important because (1) the greater the number of terms the more likely a match can take place, and (2) the greater the number of terms, the more machine time will be required. The document profile printout lists the number of index terms for each journal issue. Table I gives the average number for STAR and IAA issues processed during the first half of 1965.

TABLE I

Average Number of Indexing Terms (1965)

IAA		STAR	
Issue	Average	Issue	Average
1	16.9	1	14.1
2	16.7	2	14.7
3	16.9	3	14.5
4	16.0	4	13.4
5	15.8	5	13.8
6	15.2	6	15.3
7	15.7	7	15.3
8	15.6	8	15.4
9	15.6	9	15.8
10	16.1	10	15.8
11	15.2	11	16.1
12	15.5	12	15.8

These figures include subject terms and contract numbers where present and the expression Foreign-lang discussed in Section 4. Correction for these descriptors would not reduce the averages significantly.

As the required machine time, particularly the match time, depends on the number of terms in the profiles, any increase in the number of index terms would increase the computer time and cost. Index terms that might be added include authors, corporate sources, and other machine-sortable items from the citation tape input.

Classified input

At present, all announcements distributed under the NASA SDI system refer to unclassified documents with unlimited distribution. The announcements themselves are also, of course, unclassified. To the operator of an expanded SDI system, security-classified input material would be available if he were authorized to receive CSTAR and corresponding tapes. These are in the identical format of STAR and IAA. Prescribed security regulations would need to be implemented.

Distribution of announcements selected from classified sources presents a problem: some of the announcements themselves may be classified, requiring that the abstract cards be handled as a classified document. In an expanded system, provision could be made for the use of input tapes from which all citations had been stripped that were themselves classified.

SECTION 4. USER INTERFST PROFILES

User interest profiles must be carefully structured to take full advantage of NASA SDI system capabilities. This section is intended to clarify the various options open to the profile writer and offer some practical suggestions for constructing an optimum profile.

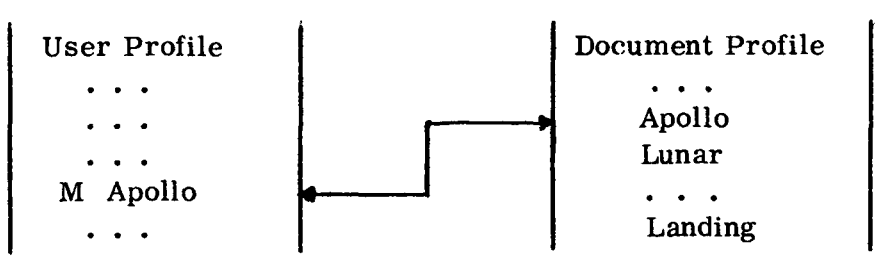
Although no particular form is essential in submitting an interest profile, the prospective user might find a properly organized submission form of value. Figures 3 and 4 illustrate a form that has been developed for this purpose. Spaces are provided for job and organizational information, of great value to the system operator in reviewing the profile for adequacy of interest representation. Grouping of spaces for the various types of possible profile content, together with brief notes concerning these, is intended to guide the user toward a well-balanced profile.

Interest profiles received by the system operator must be keypunched according to the card format prescribed in NASA CR-62021, p. 17, with care being taken that descriptor usage codes are used properly; i.e., M is used only after a must single word, the same space (Column 70) is left blank after a positive phrase or a may word, etc. As column assignment is relatively simple, any 80-column coding form may be used for instruction of the keypunch operator. In present practice, coding is done by a vocabulary specialist during his detailed review of the submitted interest profile. This assures that the profile written on the update tape will consist of descriptors actually used in report indexes as well as representing the user's interests.

Preparation of an interest profile takes thought. Periodic refinement and updating also are essential to assure good service.

Briefly, an interest profile consists of term, phrases, and negations that add up to a representation of the individual's interests. The following matching capabilities are available:

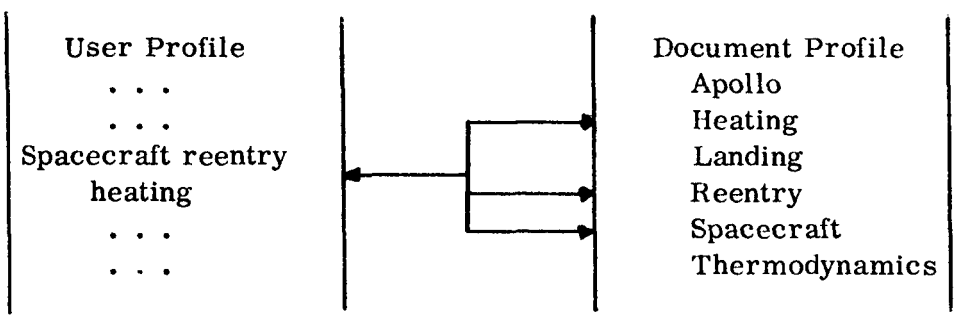
"Must" terms. Simplest type of matching between an interest profile and document indexes is accomplished on profile terms (single or hyphenated words only) to which an "M" (for "must") has been prefixed. Every document having that term in its index will be announced, unless barred by a "not" term or "not" phrase in the same profile. For example:



Inclusion of "must" terms can be beneficial if used with discretion. The possibility of receiving much extraneous material is obvious if frequently assigned index terms such as rocket or missile are listed as musts. On the other hand, the use of carefully selected must terms can help assure that all pertinent reports are announced. Generally the more specific the term, the greater its potential value as a must term. Index terms such as Concorde, Gemini, or Kiwi would be more appropriate for musting than would words of more general meaning. Musting such specific terms rather than entering phrases covering a general topic can even reduce the number of no-interest announcements. Words of many meanings, such as echo, precipitation, and mercury should preferably not be musted, unless suitably restricted by "not" terms or phrases.

Usually, whether a given term should be musted can easily be decided on the basis of the participant's or profile reviewer's experience of how frequently such a term is used or how widely it varies in meaning. In case of doubt, the Subject Authority List should be consulted (see Profile writing techniques in this section).

Phrases. The best way to reduce the flood of announcements that might result from musting certain words is to write the latter into phrases. A two-word phrase in a profile will cause a match if, and only if, the two words appear in the document index. A phrase containing three words requires the presence of three index words, as shown in the following example:



The phrase matching capability gives the NASA SDI system a broad flexibility and provides the user with the capacity for creating a tight profile. Phrases both (1) assure announcement of the topic represented and (2) reject nonrelevant information (since no match is possible unless all the terms in the phrase are present in the index). Phrases, in effect, are treated as if each one were a separate profile by itself, although they may be overriden by "not" terms and phrases. Some features of phrase matching are worth considering:

A two-word phase that gives too broad coverage may be made more specific by conversion into one or more three-word phrases. For example, heat transfer is a two-word phrase. If it were in a profile without further qualification, the participant might receive 500 announcements a year from this phrase alone, on all the conceivable topics to which heat transfer may be related. Announcements could

easily be limited more closely to those of real interest by rewriting this as convective heat transfer, reentry heat transfer, etc., as his interests dictate.

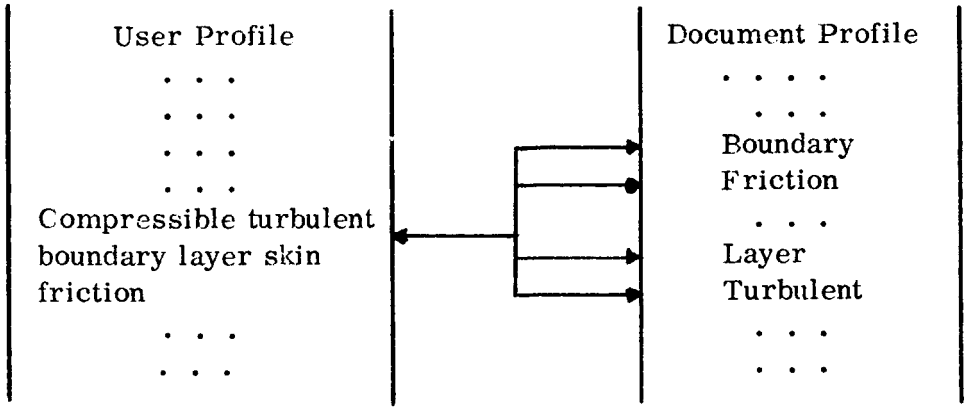
A three-word phrase should not be written into a profile without deleting or avoiding all two-word phrases containing any two of its component words. No restriction of unwanted items would be gained in such a case, as the three-word phrase would be disregarded.

All phrases have equal weight in leading to matches. It would be pointless, for example, to prefix certain phrases by an "M" in an attempt to indicate that these were of more significance. Another way of expressing this is to say that "All phrases are musts."

A phrase need not be meaningful as a grammatical expression, nor a logical one. Phrases in fact are simply "clusters" of single subject index words and are sometimes referred to by that expression. Phrases such as liquid rocket engine or manned heat shield are perfectly legitimate, and, as seen below, may be preferable to writing longer phrases that include frequently used index terms such as propellant and spacecraft. Order of words in phrases is not significant.

Seemingly redundant phrases may be included to ensure receiving announcements of reports indexed to near-synonyms.

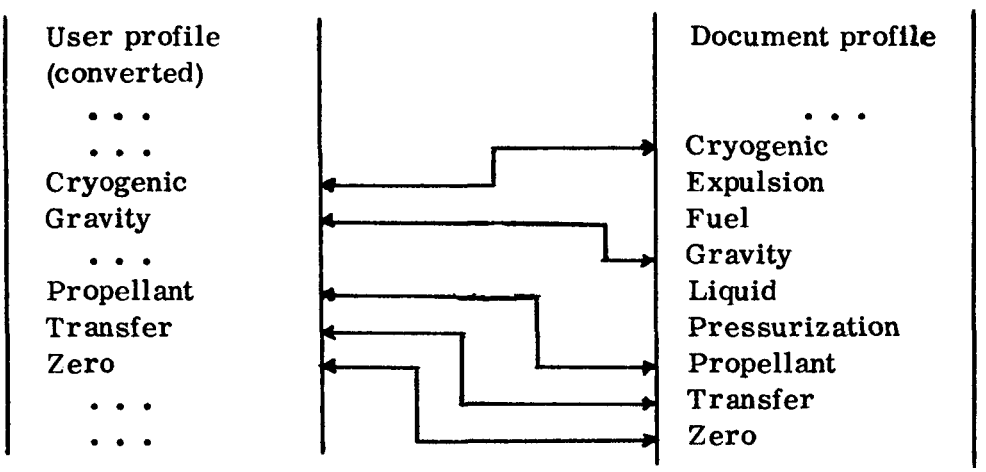
Adding more words to form longer phrases would ordinarily restrict more and more the announcements that would be selected. But the question arises, would the indexer be likely to assign so many words, identical to those in a long phrase, in indexing a report, even one containing pertinent information? The likelihood that the indexer would use a near-synonym for one of the words in a seven-word phrase or use only six of the words is obviously very great. In order to increase the chance of receiving an announcement of such a pertinent document, longer phrases are matched in this way: any combination of terms taken three words at a time out of a four- or five-word phrase, four words out of six, or five words out of a seven-word phrase. For example:



In the example, the document will be announced even though the index terms compressible or skin had not been assigned by the indexer.

Care should be taken in writing longer phrases, however, as this combinational type of matching can occasionally lead to receipt of notices diametrically opposed to the subject of interest. In cases of doubt, a word or two can usually be eliminated to back up to a three-word phrase. For example, the four-word phrase, manned spacecraft heat shield, would lead, because any three words are matched, to announcements of reports of heat shields on both manned and unmanned spacecraft. It might profitably be converted to the three-word phrase, manned heat shield. "Not" terms or phrases might also be used to reduce announcements of unwanted items.

Percentage matching. The capability of matching by percentages of the number of single terms is an evolutionary survival of the earliest days of NASA SDI development, when the participant's interest profile consisted merely of a listing of single terms, corresponding in appearance to the document profile (NASA CR-62020, p. 16). Matching was statistical; a certain percentage (say 17%) of the terms in the shorter of the two profiles was selected on the basis of past experience; if the resulting number of terms in the interest profile was identical with the same number of any of the terms in the subject index, a match occurred. The number of false associations tended to be high if the percentage were set low, in which event any two or three words might match. This matching capability was later subordinated to the more flexible matching provided by phrases, must terms, etc. In percentage matching, all the phrases are disassociated into single words. The latter are then taken in combination with any single words in the unaltered profile (these are known as "may" words) and percentage matched against the report indexes. The percentage is set high, however. At present, 50% of the number of terms in the shorter profile, usually the subject index of a document, are required to match before an announcement is sent out.

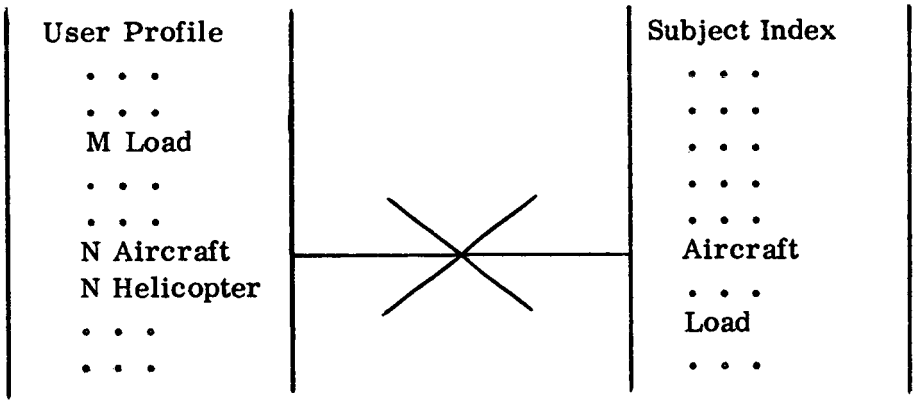


As the match factor is set so high, a large number of words must be identical for a match to take place. Therefore, if a match occurs it is likely, in theory, to be of specific interest. A possible advantage of this form of matching is that it gives the participant a chance to get an announcement of a pertinent document that could not have been announced to him by

phrases or other features of his profile. Reports on the reasons for matches, see section 6, indicate that only about 3% of all matches result from this option. Furthermore, since in the match process the percentage match follows the match for must terms, but precedes the match against phrases, many announcements attributed to a "may" match would have been selected by a profile phrase in any event. Probably only 1% of all announcements are uniquely selected by percentage matching when the minimum for a match is set at 50%.

The program could be modified so that a given number of terms, say 4 or 5, can be required to match rather than a number determined for each document by a specified percentage of terms. This type of matching was tried for several months. Results in number and relevance of announcements were not significantly different from a percentage type match.

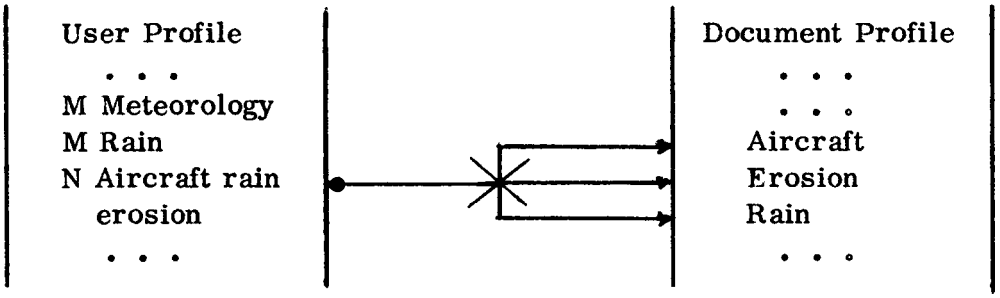
"Not" terms. If an independent word in an interest profile is preceded by an "N" the computer will not send an announcement of any report whose index contains that word, no matter how good the match is otherwise. The "not" indication overrides all other instructions, even the "must." This capability is very useful where a must term or short phrase best expresses a participant's broad interests, yet he does not wish to receive certain types of announcements. For example, the following profile suggests that the participant is interested in the subject of loads on spacecraft, launch vehicles, satellites, etc., under all possible conditions of transportation, staging, launching, docking in space, etc. Rather than write phrases for all the multitude of possible relationships, he has musted the word "load." However, he is not interested in loads on aircraft or helicopters, therefore he has indicated these as "not" terms.



He would ordinarily have received an announcement of the report indexed in the example, but the negation before the term "aircraft" has properly barred this.

"Not" terms must be used with care, after due consideration of the possibility that information of interest might be included in a report with information that the participant does not want. In the example, if information concerning loads on both aircraft and spacecraft were discussed in a single report and indexed to these terms, the participant would not receive a notice of this report, although it would indubitably have been of interest.

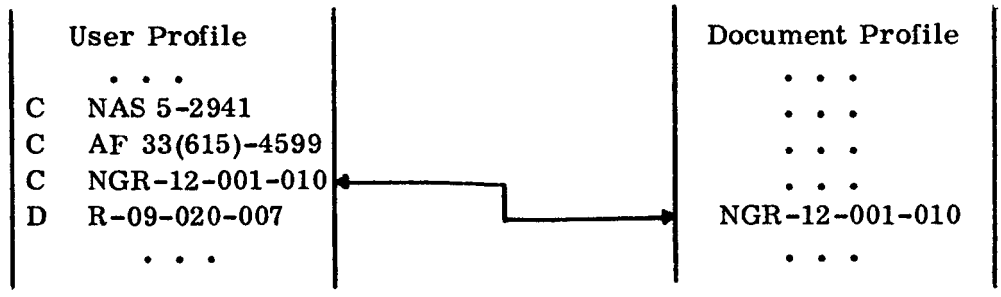
"Not" Phrases. Just as the wide range of announcements selected by a "must" term can be narrowed by converting the must term into a phrase, a "not" term can be made more specific in forestalling unwanted announcements by changing it to a "not" phrase. An "N" preceding a phrase will override all matching possibilities if all the words in the "not" phrase appear in the subject index. The participant in the following example is interested in meteorological aspects of rain, not in the erosion of aircraft surfaces caused by rain. He therefore "musts" the word rain, but "nots" the phrase aircraft rain erosion. The likelihood that a report whose announcement was barred by this phrase would also contain significant meteorological information is clearly smaller than the likelihood that a report barred by simply negating the single term "aircraft" might contain information of interest.



Phrases, as well as must terms, may be modified by adding not phrases to the profile. It is very important to note that a not phrase should be longer than any positive phrase made up of its component words.

Not phrases of 4 to 7 words operate in the exact inverse of positive phrases of the same length. That is, a four-word not phrase will stop an announcement if any three of its words appear in the document index.

Contract numbers. Incorporating contract and grant numbers into an interest profile can help assure that announcements in certain specific areas will be received regardless of failure to match through index terms. Conversely, including contract or grant numbers as negations can reduce the number of announcements, as by stopping announcements that a participant might be getting as part of his official duties. The more specific the contract or grant, the more specific the announcements. Contracts covering interdisciplinary studies should only be included with full realization that many documents far from a participant's interests may be announced to him.



Contract numbers are special descriptors. In printouts of user profiles, they are preceded by a "C" if a must term, a "D" if a not term. They must be entered into the user profile in exactly the same standardized form in which they appear on the input tape.

Miscellaneous match options. In response to relatively frequent requests from SDI participants to avoid announcements of documents in a foreign language, the option of "notting" such documents was added. Translation services are plentifully available throughout NASA; the primary purpose of such requests was reduction of total announcements by eliminating an area of information that might be called to users' attention by other means. Adding the expression Not Foreign-Lang to an interest profile reduces the number of IAA announcements by approximately one-third.

Programming this option was accomplished by reading blocks 45-46 on the input tape (see Sect. 5). These provide two digits for the language of the document: 01, English; 02, mixed languages as in some conference reports; 12 to 98 other languages. The program adds Foreign-lang to the document profile if any digits except 01 and 02 are present in this block. This term on the document profile is thus treated as an ordinary descriptor, equivalent to a subject term.

Profile writing techniques. Writing a good interest profile can be approached systematically with the aid of two publications. The first, Guide to the Subject Indexes for Scientific and Technical Aerospace Reports, SP-7016 (Rev 3)[1], lists the most common vocabulary terms plus numerous cross references (figs. 5 and 6). The profile writer may use this guide to assist his memory as he makes a tenative list of single words and phrases to describe his interests. He will find the numerous phrases listed to be particularly helpful in creating an optimum profile. He may enter phrases as listed or may rewrite them into longer phrases to obtain greater specificity.

The single words tentatively written down as subjects of interest should next be considered as to the advisability of (1) musting them, (2) musting with addition of not terms and/or not phrases, or (3) writing into phrases. The optimum choice can sometimes be decided by the participant from his own experience, but it will often help to consult the Subject Authority List. This publication, which is a 500-page computer printout, is updated and distributed monthly to all recipients of the NASA linear file tape. A sample page is shown in figure 7. The columns show the number of documents to which the particular index term has been assigned in each year (2 = 1962, 3 = 1963, etc.) and journal (A = IAA, N = STAR, X = CSTAR). An estimate can thus be obtained of the number of announcements that might be received if a particular word were musted without qualification.

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[1] Distributed to all recipients of Scientific and Technical Aerospace Reports (STAR). It may also be purchased from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va., 22151. Price $3.75.

Many less commonly used index terms may be discovered in the Subject Authority List. Their use in interest profiles instead of, or in addition to, descriptors of more general meaning can be beneficial in assuring announcement of documents of specific interest. The overall number of selected announcements will not be increased significantly since the terms are infrequently posted.

In general, words that are not in the Subject Authority List should not be used in the interest profile, either as independent words or in phrases. However, new terminology that might reasonably be expected to be added to the vocabulary in the future may be included. How these not-in-vocabulary (NIV) terms are handled is discussed in Section 5.

Of utmost importance is to avoid writing an initial profile of too great length, especially one which attempts to cover many broad subject areas. If the NASA SDI participant begins with a limited profile, he can understand the reasons for the announcements he receives and recognize changes that need to be made to improve his profile. Furthermore, he can readily add the proper combination of terms and phrases to receive announcements in new subject areas. On the other hand, if he attempts to begin receiving service with a profile hundreds of lines long, into which he has tossed any words and short phrases that have caught his attention while looking through the Guide to the Subject Indexes for STAR, he will be overwhelmed by hundreds of announcements, most of which will be unrelated to his real interests. Such a situation will be almost impossible to correct by less than the most drastic profile pruning; in effect, by starting over. If feasible, profiles should be written during a joint discussion between participant and profile reviewer.

Profile reports. In order to assist the participants in evaluating and modifying their current interest profiles, the latter are printed and distributed at regular intervals. These and other user profile reports are discussed in Section 6.

Profile Review. In the present NASA SDI program, it is felt essential that all new interest profiles and profile change be reviewed by professional vocabulary and indexing specialists who are also thoroughly familiar with the workings of the system. These profile reviewers have available such tools as the Subject Authority List. In addition to new profiles, the reviewer will regularly select individual profiles for detailed review. A profile to be examined may be that of an individual interested in obtaining improved service, or that of a participant whose response record has shown a low percentage of hits. (Evaluation of responses is discussed in Section 9.)

Profile review may be undertaken by simple consideration of each line of the profile in light of the participant's known interests. Another powerful method of profile improvement is consideration of the subject indexes for specific documents that were selected by the individual's profile but which he has indicated are of no interest. Comparison of the subject indexes, which are available as a computer printout following

each run (see Section 6), with the interest profile will perhaps show that a particular must term is actually of broader interest than presumed or that a two-word phrase inevitably will lead to many false associations. (An example of such a phrase is Liquid gas; both Liquid and Gas might occur together as terms in many report indexes and cause a match, but the document itself might have nothing to do with liquified gas.) The reviewer can decide, by considering all the index terms, whether to write the offending term into a phrase, or the phrase into a longer phrase, or to modify its selection power by adding one or more not terms or phrases. This method is particularly useful in choosing not phrases, since words that might be used to bar unwanted announcements will be found to repeat themselves in a number of the indexes of no-interest documents.

A definite trend during developmental operation of the program has been the increasing initiative assigned to vocabulary and indexing specialists in revising profile structures. Significant changes are, of course, brought to the user's attention. Ideally, a profile should combine the experiences of both the participant and the vocabulary specialist.

SECTION 5. COMPUTER SYSTEM

Two major computer programs comprise the NASA SDI system. The first program, vocabulary control or VOCON, updates or originates the user profiles and vocabulary control guide (the "dictionary") and edits both user and document profiles against the guide. The second program, MATCH, compares document and user profiles, and generates announcements when the designated match criteria are met. Both programs require an IBM 7090/94 data processing system with at least eight tape drives.

Documentation of these programs, consisting of operating instructions, record formats, and detailed flow charts, is presented in NASA CR-62021. The present report need only comment on the relation of input (user and document profiles) to system design and provide operating experience (run times) not given in the program documentation.

Vocabulary control (VOCON). Vocabulary control refers to the necessity of having user profile and document index utilize the same words so that a computer match between them is possible. In the NASA SDI system, vocabulary control is accomplished by a vocabulary control guide, also called a dictionary, which consists at present of single-word terms, although longer expressions (phrases) up to 120 characters can be incorporated. Terms are added to the dictionary whenever the computer finds them in a document index . In addition, terms may be added or deleted by the system operator. An equate function allows the operator to designate selected vocabulary terms as synonyms or as trouble terms.

The dictionary and its uses in vocabulary control is discussed in NASA CR-62020, pp. 11-14, and NASA CR-62021, pp. 11-12. Figure 8 illustrates the appearance of a printout of the dictionary for the latter format. Left to right, the columns are: (1) an alphanumeric descriptor (only single words are being added currently to the dictionary), (2) its coded value as a primary descriptor, (3) the coded value of its corresponding secondary descriptor (if this were zero, the descriptor would be a trouble term; if not zero, but different from the preceding column, it would be a synonym), (4) date descriptor was first added to the dictionary, either the date it first appeared in the document profiles or the date it was first added by the operator, (5) date descriptor first appeared in a user profile, (6) number of times that descriptor has appeared in document profiles, and (7) number of times that descriptor has appeared in user interest profiles. As may be seen, few authors appear in user profiles, few phrases in document profiles. Personal authors and multiword descriptors were not added to the dictionary during the later stages of the system operation.

This dictionary printout was accomplished by a 7090-1401 utility program which is available as part of the general NASA SDI computer program. Vocabulary control by use of the dictionary was not utilized in the operating system except for rejecting words not in the dictionary. This consisted usually of blocking the addition of misspelled or improperly constructed words. For example, if an attempt was made to add a plural

descriptor (e.g., Rockets) to a user profile, whereas only the singular (Rocket) had been approved for indexing use, the vocabulary would reject the term. A change in the philosophy of user-operator relations in control of interest profile content was responsible for not making greater use of this exceptionally powerful tool. Initially, addition of an interest profile to the SDI system was intended to be accomplished with little or no editorial review; it was to be essentially a clerical operation. A computer equate function would, therefore, have been necessary to convert the user's words to those of the approved vocabulary, plurals to singular, adjectives to noun form, misspellings to correct spelling, etc., as described in a hypothetical example in NASA CR-62020, p. 12.

Although this automatic system was tested and found to work satisfactorily, it was never put to practical use as a part of the overall SDI operations. Instead, skilled vocabulary control personnel were very early assigned to review and editing of incoming user profiles as well as to user-indicated changes. All terms and phrases in the user profile were checked manually against the Subject Authority List before being entered on the keypunch instruction sheet.

User profile rejection. A certain minimum percentage of the descriptors in a user profile must be accepted, that is, be identical with a term in the vocabulary, or the profile will be rejected. The minimum percentage is entered by the operator on control card MINU (NASA CR-62021, pp.7, 15). During most of the operating period, the minimum was set at 50 percent. User numbers of rejected profiles appear on the print-out of user transactions, while the total number of rejected profiles is tabulated in the program activity summary (see Section 6).

As with certain other features of the program, profile rejection by the computer in this manner presupposes the entry of unrefined user profiles. If profiles are entered only after thorough review by vocabulary specialists, rejection does not occur.

NIV (Not in Vocabulary) profile terms. NASA SDI participants are encouraged to use currently developing technology in writing or changing their interest profiles. New project or equipment names, in particular, should be entered as soon as the interested participant becomes aware of their existence, even before reports or articles are received by the journal abstractor-indexers. Presence of the new terms, which will likely be approved for indexing use, helps assure notification of these new documents.

Handling of NIV terms during processing of new interest profiles or changes to existing profiles presents a problem under a policy of restricting the size of the SDI dictionary. NIV terms are therefore handled in the following manner: When the profile reviewer checks a term on a new profile or in a user's instruction to modify an existing profile and recognizes that it is not in the current Subject Authority List, he codes the term or its associated phrase on a keypunch instruction form just as if it were to be added to the profile, but across the form he will write "Pink Card." When the resulting card on pink stock is returned from keypunching and interpreting, the reviewer will file it manually by the NIV term in a small tickler file. If the NIV term is in a phrase,

cards for both the individual term and the phrase are keypunched and filed. When the profile reviewer then receives a listing of newly approved vocabulary terms (see Section 3), he checks each approved term against the NIV file. If pink cards related to the term are found, they are pulled, the participant's name is observed, and his current profile is reviewed to assure that changing interests have not deleted the NIV term or phrase. If not, the cards are entered into the next user transaction run. Timing of term approval and distribution of authority lists is such that a word approved for indexing a new document in process can be added to a user's profile in time to take part in matching against the same document.

Users should be cautioned that unapproved terms or phrases will not be printed out on the periodically distributed profiles. Until entered from the above described NIV suspense file, these terms and phrases do not occur in the historical profile tapes from which the profiles are printed.

Match program. The document profile tapes and user profile tapes that have been coded by VOCON are compared by the MATCH program, which is described very briefly in NASA CR-62020, p. 18, and in detail in NASA CR-62021, pp. 182-202. The format of the coded profiles is given in NASA CR-62021, pp. 12-13.

The MATCH program is a straightforward procedure. Each document profile is compared in turn with each user profile in the following manner: The user profile is searched for the first descriptor in the document profile, then for the second, third, and so on to the end of the document profile. The same routine is then followed, using these same descriptors, for the next user profile, while a second document profile is being matched against the first user profile, and so on. In the present NASA SDI operation the MATCH cycle is repeated for over 700,000 user-document profile pairs during each computer run.

For each user-document profile pair, the computer asks the following questions in turn:

1. Are any words, including any in phrases, the same? If not, the program goes to the next profile.

2. Is at least one of any identical words a not descriptor? If so, the program goes to the next profile.

3. Is one of the identical words a must? If so, the program checks for not phrases.

4. Are there enough identical words for a percentage match? If so, the program checks for not phrases.

5. Do any phrases match; i.e., all words in a 2- or 3-word phrase, at least

3 in a 4-word phrase, 3 in 5, 4 in 6, or 5 in 7? If so, the program checks for not phrases.

6. Are any possible matches by must terms, percentage, or phrases barred by not phrases? (All words in a 2- or 3-word not phrase must be in the document profile to bar an announcement, but only any 3 words out of a 4-word phrase, etc., just as with positive phrases.) If so, the program goes to the next profile. If not, an announcement is written on the output notice tape.

Output of the 7090/94 MATCH program consists of a document notice tape having the following storage layout in unsorted card image records:

Location	Content
1	Microfiche availability (#)
2	User's first initial
3	Document type (N for STAR, A for IAA)
4	User's second initial
5	Notice type Blank = may M = must P = phrase 9 = random
6 - 15	User surname
16 - 21	User profile number
23 - 32	User address (first ten characters)
33 - 38	Document number (accession number minus N65- or A65-)
40 - 50	Next eleven characters of user address
77 - 80	Next four characters of user address
81 - 86	Issue number of abstract journal (formerly date)
88 - 90	Notice code (reason for match)

Several changes from the format presented for the IBM operation of the program, as given in NASA CR-62021, pp. 185-186, may be noted. These changes are discussed in subsequent sections of this report.

Computer run times. Estimates on the time required to complete the VOCON and MATCH programs for various number of users and documents processed are given in Table II.

TABLE II

ESTIMATED 7090/94 COMPUTER TIMES (HOURS)

Documents	Users	VOCON*	MATCH	Total
1000	500	0.8	1.0	1.8
	700	0.9	1.4	2.3
	1000	1.0	2.0	3.0
2000	500	1.5	2.0	3.5
	700	1.6	2.8	4.4
	1000	1.7	4.0	5.7

* Add 15 seconds for each new user profile being entered into the system.

This table is based on experience with the NASA SDI system utilizing an IBM 7094 II computer and processing 900 to 1500 documents per run for service to 700 to 800 users. Processing times were normalized to 700 users and 1000 documents. Other figures in the table were estimated on the assumptions that processing of document input profiles is proportional to the number of documents, that the rate of updating user profiles is relatively constant, and that required match time is proportional to the number of user-document profile pairs. Actual run times will, of course, vary with the activity in making user profile changes, number of index terms assigned to the average document, average length of user profiles, size of the dictionary, model of computer used, and other factors. Experience has shown that considerable machine time can be wasted if deficient housekeeping practices have resulted in poor quality tapes leading to numerous read and write redundancies.

Random notifications. Randomly selected notifications (see NASA CR-62020, pp. 24-25) were intended to aid in profile modification. A user who indicated that a random notice was of interest was sent a tab card form notifying him that he had done so, listing the index descriptors assigned to the accepted random notice, and asking him if he wished to circle certain terms to be added to his profile (NASA CR-62020, p. 2-25). The capability for issuing random notices was not utilized during the later phases of operation, the subroutines (NASA CR-62021, pp. 183-184) having been bypassed. In a decentralized operation, the capability could be reinstated.

Random notice generation was dropped for several reasons:

1. A fixed number of random announcements (actually a fixed maximum as specified by control card NRAND minus any that would have been selected or barred by the user's profile) are sent to every participant. This

number bears no relation to the total number of announcements the individual receives. For participants who receive few notifications, the random ones may be more numerous than those selected according to his expressed interests.

2. If the number of random announcements sent to every participant is set low, 2 or 3 per 1000 documents processed, the number of chances for thus modifying the profile is relatively small in the course of a year.

3. Relating the revealed index terms to the best formulation of a phase, negation, or other option in the interest profile is difficult. The user in most cases merely circles a single word, which if entered into his profile as an additional "may" term would have little or no result. Optimally, some phrase containing the circled word should be entered, perhaps with other qualifiers such as not phrases. This would be difficult for a reviewer to do solely on the basis of a returned card.

Reestablishment of the random notification concept might be considered with changes in some of its concepts. Each random notice might be labeled as such, perhaps leading to more careful consideration by the user as to its actual relevance to his interests. "Of interest" responses to random notices might be sorted by user and considered collectively, perhaps being returned to the user with a copy of his profile and suggestions for changes.

SECTION 6

OPERATIONS REPORTS

The SDI operating staff can be provided with the following reports from each computer run of the update and match programs.

1. Frequency list. Overall number of copies of each abstract required.

2. User accession list. Printout by participant of each abstract selected for him with the reason for its selection.

3. Input card error list.

4. Dictionary changes.

5. User transactions. Printout of all changes to the system, including new and deleted participants and their profiles, descriptors added to each profile or reasons for their rejection, deleted descriptors, etc.

6. Document profiles. Printout of all index terms assigned to the documents taking part in the current run.

For review purposes, the following reports are called for from time to time.

1. User profiles. Printout of individual's active or historical interest profiles.

2. Vocabulary control (dictionary) printout.

Reports in the first group are generated by IBM 1410 and 1401 programs which are not documented nor described in the IBM final report. (An IBM 1401 could be used exclusively at some loss of speed.) The preparation of these reports and their format is presented here for completeness.

All these routine operating reports begin with the necessary sorts of the unsorted document notice output tape (NASA CR-62021, p. 185). This tape is first sorted by the document accession number (e.g. N65-12345, N65-12346...) and, as a minor sort, by the participating center (e.g. Langley, Lewis, ...). This is accomplished on an IBM 1410 by program SDI-01, a standard 1410 operating system sort.

(Format and run times of this and other SDI auxiliary programs are given in Appendix A.)

Frequency list. A 1401 program (SDI-10), using SDI-01 as input, lists on a a 1403 printer a double columnar arrangement indicating (1) the total number of notices generated for each document and (2) the total number of abstract cards to be produced for each. Column 2 is the sum of Column 1 plus some fixed number of abstract cards to be produced for other purposes than SDI.

A sample page of a frequency list is illustrated in Fig. 9. The SDI-10 program totals Column 1 to give the sum of each journal issue. In the total, the following code symbols are used for the 1000's and 10,000's position; i.e., V678 = 15,678:

# 10	Y 18
/ 11	Z 19
S 12	- 20
T 13	J 21
U 14	K 22
V 15	L 23
W 16	M 24
X 17	N 25

User Accession list. A listing by participant of the accession numbers of each selected announcement, together with the reason for its selection, have been provided the NASA SDI representative at each Center. A typical page of a user accession list is shown in Fig. 10. Symbols following each accession number (MUST; PHR 3,4; MAY .53, etc.) express the reason for its selection, as by a must term, three words out of a four-word phrase, a percentage match in which 53% of the words in the shorter of the user or document profile were identical, etc. Although the specific must term or phrase causing the match is not indicated, this can usually be observed quickly on comparing the user profile with the profile of the document in question. The user accession list is thus invaluable for improving user profiles. Reasons for selection of no-interest items can be determined and corrected.

Certain features of the user accession list are noteworthy. For items selected by longer phrases, the actual number of matching words is given, as four for a four-word phrase, although fewer words, three in this case, would suffice for a match. The actual percentage of terms that matched for a may selection is shown, but this will never be less than a certain minimum, currently 50%. The minimum percentage for a may match is printed at the top of each page. It is important to note that alternate match possibilities are not given; that is, since the order of match is (1) must terms, (2) percentage match, (3) phrases, a must or percentage match might also have matched by a phrase. This possibility, which is important in profile modification, can usually be observed readily when comparing user and document profiles.

In order to obtain the user accession listing, it is necessary to make a separate sort of the document notice output tape. This is done by program SDI 03. This 1410 program sorts by (1) Center, (2) user's last name, and (3) document number. Output is used by a 1401 print program, SDI 13, to list the user accessions. These programs are used only because separate reports for the various locations served by the NASA SDI program are sent to the librarians at each location. For a system that would be operated only at one location, two similar programs, SDI 02 and SDI 12, which sort and print out only by user and document number, are available.

Error list. Input card errors, such as an incorrect header card, are entered on the system output tape during Phase 2 of VOCON and are printed out at the same time as user transactions and other reports.

The system operator minimizes input errors by having an EAM printout made immediately after the input cards have been keypunched. This listing is reviewed to make sure that all input cards are properly formatted. It may also be compared with the keypunch coding sheets.

Dictionary change list. Document profiles and user profile changes are compared with the dictionary during Phase 4 of VOCON. If any document index terms are not already on the dictionary, they are added automatically. The operator is apprised of this by a printout from the system output tape on which the new descriptor and its coded value appear with the notation Descriptor added to dictionary. Information concerning descriptors added by the operator also appears on this printout; e.g., Descriptor already on dictionary. Cannot be added.

User transaction list. User profile transaction tapes, which are sorted by user profile number, carry all descriptors in alphanumeric as well as coded representation (see NASA CR-62021, pp. 89, 136). Printouts of all user profile changes are supplied for the operator's review during each production run. These printouts list added, rejected, and deleted descriptors, added user profiles with all terms, and deleted user profiles. This information had been placed on the system output tape during Phase 8 of VOCON, and from which the user profile transaction printout is supplied routinely using a standard 1401 print program.

Figure 11 is a sample page from the user profile transaction printout. It shows, in order, six descriptors added to an existing profile, a deletion of one phrase and addition of another to the same profile, a failure to delete a term because it was misspelled on the delete card, a rejection of a user profile, a change of address, addition of a single word, another address change, two additions of the Not foreign language capability, etc. Note that single terms bear no indication as to whether they are must, not, or may terms; this is shown, however, on any active user reports which have been requested. In the latter, the coded descriptor is included with the alphanumeric, and the first octal number in the coded description provides this identification (see NASA CR-62021, p. 13).

At the end of the user transaction printout, all changes are summarized, a typical summary being shown in Fig. 12.

The profile reviewer examines carefully each user transaction printout. A rejected profile may mean that no header card has been prepared. A rejected term may have been incorrectly coded to a nonexistent or previously deleted user profile. Consideration must also be given to the addition of rejected terms to the dictionary.

Document profiles. The profile reviewer will frequently have reason to examine the index terms (document profiles) that have taken part in the match program. Consideration of the document profiles in conjunction with the announcements selected by a user interest profile -- or failed to be selected if "misses" are being considered -- is unquestionably the best way to improve the profile. In order to provide the reviewers with a copy of the document profile in convenient form, the system is designed so that the stripped linear file ready to go to the machine coding process is printed out in the format shown in Fig. 13. This printout may contain more than merely subject index terms. Contract numbers and the expression Foreign-lang (see Section 4) are added from the appropriate document codes on the linear file record. If other linear file elements (see Section 3) were to be picked up, they would also appear on this printout. Additional information concerning each document is shown in the header line that begins and ends each document profile. This is an alphanumeric dump of the reformatted linear file input. The profile descriptors include published index terms as well as machine terms, as is evident from the presence of multiword descriptors. These are not distinguished by any marking, however, since in the 7090/94 program all multiword descriptors are disassociated into their component parts before being entered into the coded document profiles.

A rejected profile would have the work Rejected printed where Accepted otherwise appears. Its index terms would not be printed out. Rejection of a document profile or a document index term is rare, but may be caused by an error in the document header or by a misspelling. New descriptors will appear with the annotation Descriptor added to dictionary in the printout of dictionary changes.

On completion of the document profile printout, the number of accepted and rejected profiles and descriptors is summarized, as in Fig. 14.

User profile reports. In order to obtain an up-to-date copy of a particular user's profile, the profile reviewer requests either an "active" report or a "complete" report by entering input cards punched as prescribed in NASA CR-62021, p. 18. These reports, which are printed out in the user transactions during the next computer run, are known colloquially as "R-1" and "R-2" reports because these characters are keypunched in card columns 71 and 72. A page from an R-1, an active user profile report, which consists of current descriptors with their coded values and dates of entry, is illustrated in Fig. 15. A page from an R-2, a complete historical profile report, which includes all current and deleted descriptors, with dates of deletion, is shown in Fig. 16.

Note that the date of entry or deletion may be either a calendar date or, as the result of a recent change, the issue number of the journal being processed.

The first column of the coded descriptor gives information concerning the type of match in which it takes part (see NASA CR-62021, p. 13). A 0 indicates a may term; a 1, a must; a 7, a not.

Periodically, all current user profiles are printed out in a compact, double column format for distribution to the participants. On this printout, which is illustrated in Fig. 17, must and not terms are preceded by an M or N. The print program, which for 700 profiles requires about five minutes of 7094 time for formatting and 30 minutes of 1401 time for printing, is available as part of the general NASA SDI package.

Vocabulary (dictionary) printout. This report is discussed in Section 5. A sample page is shown in Fig. 8.

Master user record. For production of address cards, generation of user listings, etc., a master file of tab cards is maintained which has the following format:

Columns	Content
1 - 6	Profile number
8 - 10	Location (Center)
12 - 42	Surname, initials, title, etc.
43 - 80	Address

To distinguish these cards from others entering the processing cycle, such as user-header and change cards, they are color coded. The profile editor simply writes "Green stripe" across the coding sheet on which he enters a master record. The keypuncher then selects the correct card stock.

SECTION 7

ANNOUNCEMENTS

A sample announcement such as participants in the 7090/94 NASA SDI system received is pictured in Fig. 2. It consists of an abstract card and a response card, delivered in a sealed window envelope. Details of the abstract and response cards are given in Figs. 18, 19, and 20. Significant changes will be noted in comparison with the earlier announcements shown in NASA CR-62020, p. 21.

Response card. The important response card, also referred to as the notification-evaluation card, has been modified by (1) changing the date, which was originally the date on which the announcement was mailed, to a more meaningful symbol for the journal in which the abstract appears (N for STAR, A for IAA) and the issue number (01 to 24), and (2) adding a "#" symbol to indicate the availability of the document in microfiche (cf. Fig. 18).

The first of these changes assists the user in comparing the announcements he received with the corresponding issue of the journal so as to evaluate the service being received. The second change aids his librarian in recognizing that a request for a document might be filled with the convenient microfiche.

The format for the response card is pictured in Fig. 19. For an independent operation, the card could be redesigned.

Data to prepare the response cards are available on the 7090/94 system output tape. From this the response cards are punched with the user's code number, name and address, accession number of the selected document, issue from which it was taken, and a "#" symbol to indicate that microfiche copies of the document were available. Punching is done by program SDI 11 (See Appendix A) using a 1401 computer and input from SDI 01. The punched cards are in order by accession number with a minor sort by Center. After the response cards are punched they are interpreted on an IBM 557 Alphabetic Interpreter. Although a wiring diagram of the IBM 557 to be used for interpreting blue cards is given in NASA CR-62021, p. 187, it is not completely up to date, as the date was later changed to journal and issue number, and the "#" symbol was added.

The following are updated plug board entries for the NASA SDI response card interpretation:

Entry 1, Print line 16

Card Column	Print Position
2	39 -- First Initial
4	40 -- Second Initial
6-15	42-51 -- Last Name
26-28	56-58 -- Center Code

Entry 2, Print line 17

16-21	17-22 -- User Profile Number
3	24 -- Document Type
72	25 --) Issue Number
74	26 --)
34-38	28-32 -- Accession Number
1	34 -- Microfiche Code
23-25	39-41 --) Internal Address
29-32	42-45 --)
40-50	46-56 --)
77-80	57-60 --)

Port-A-Punch Positions:

Of Interest, Document Requested	occurs as	12 zone punch in col. 71
Of Interest, Document Not Requested	occurs as	"x" or 11 zone punch in col. 73
Of Interest, Have Seen Before	occurs as	zero punch in col. 75
Of No Interest	occurs as	2 punch in col. 73
Comments	occurs as	3 punch in col. 75

Several card columns (5 and 33) are not interpreted. The information punched in these columns is used in obtaining printouts of user notices and the reasons for their selection (See Section 6).

Abstract card. The abstract card, a sample of which is illustrated in Fig. 20, is obtained in the following manner: When a report is accessioned by the NASA Facility, it is cataloged and abstracted. An accession number is assigned for future use in ordering copies or reproductions. Abstract and citation are typed with simultaneous generation of a paper tape. The latter is used to drive a photographic composition machine, which produces a justified galley on undeveloped photographic paper. The exposed paper is developed photographically through standard darkroom techniques. After proofreading corrections are made, the resulting galley, which is in 12 point Univers Bold type, is the raw material from which both the offset printed STAR and the NASA SDI abstract cards are produced.

Composition of IAA is an independent operation by the American Institute of Aeronautics and Astronautics, New York City. Abstracts are typewritten, not photocomposed, and are not justified. A high standard of legibility is obtained in the

final output, however. The final galleys are forwarded to the NASA Facility for production of abstract cards for those announcements selected from IAA.

When the galleys for STAR and IAA are received, they are reduced photographically. It can be noted that the NASA SDI abstracts are in smaller type than in their corresponding appearance in STAR and IAA. All abstract cards are reproduced at the same reduction from the original copy. The original 12-point output is reduced to 70 per cent for the abstract journals, to 55 per cent for the abstract cards.

This reduction ratio was selected to minimize the number of cards on which the abstract must occupy two columns. A statistical analysis of STAR , Vol. 3, Issues 1 to 3, showed that only 2.2 per cent of all abstracts required a second column. IAA abstracts were somewhat longer, 6.5 per cent running into a second column, or a combined average of 3.8 per cent.

The photographs of the abstracts are cut up and arranged by accession number for reproduction. The actual number printed is determined by a frequency list obtained as part of the computer matching (Fig. 9). This gives the total number of each announcement required by all participants, perhaps only 4 or 5 of a special interest item, 40 to 50 of a document of broader content.

After multilith reproduction of the desired number of announcements, the resulting six-announcement sheets are cut carefully to 7 3/8 inches long by 3 inches wide.

Distribution of abstract cards having a high graphic arts quality is a unique feature of the NASA SDI system, and one of the most popular. A questionnaire (NASA CR-62020) showed that 90% of all recipients were filing some of the cards that they received. The fact that the cards are reproduced from the journal abstracts, rather than printed by computer, means that special symbols and mathematical formulas can be presented, and of course makes for excellent readibility.

Microfiche of abstracts. An independent operator of this SDI system who wishes to supply abstracts to his participants may reproduce them from microfiche of abstracts. Microfiche of all abstracts in STAR and IAA issues are available to NASA Centers and contractors on request.

Envelope insertion. After the required number of abstract cards have been reproduced, the blocks of identical cards are separated by any convenient dividers, such as two or three colored cards stapled together. A number of blocks of cards are then inserted in one of the hoppers of a standard business envelope inserter. The blue response cards, after they have been interpreted, are handled in the same way.

A block of response cards, each of which is interpreted with the same accession number but, of course, with different user names, is separated from the

succeeding block by a manually inserted divider, as with the abstract cards. The envelope inserter is then started, and operation continues until stopped by the divider between the blocks of blue response cards or by the action of the operator. The operator then discards the remainder of the corresponding white abstract cards in the other hopper, and again starts the machine, repeating these steps until all blocks of cards have been inserted. This procedure assures that the proper abstract card accompanies each response card.

Careful adjustment of the envelope inserter is essential to avoid inserting three cards in one envelope or inserting only one. Another important check on system output is an inspection of the abstract cards by a quick ruffle of each block of abstract cards before stacking them in the envelope inserter. This assures that all cards have been printed properly.

Envelopes. Any window envelopes of suitable size for abstract card insertion and in which the name and address on the response card registers with the window are satisfactory for NASA SDI use. It is important that the adhesive area or areas on the flaps be of optimum dimensions for ease of opening the sealed envelopes by the recipient.

SECTION 8

HANDLING DOCUMENT REQUESTS

Requests by NASA SDI participants for the full text of announced documents have been brought to the awareness of library personnel by their receipt of the blue response cards after these had been punched by the user and dropped in his outbox. Library practices in handling these returned cards vary among the different NASA Centers. At smaller Centers, the requested cards are scanned visually to separate those punched "Of interest, document requested." At Centers with larger numbers of participants, all the returned response cards may be sorted on EAM equipment to give a pull list, as well as to generate local response statistics.

Once the librarian has separated those cards requesting documents or has a pull list printed, the requested items may be transferred to the usual library request form or, to save time, may be filled more expeditiously, as by pulling copies of microfiche from a file and forwarding without keeping a record. Because the second response card, which had been used as an address card (NASA CR-62020, pp. 22-3) was later dropped from the system, some libraries, to save the time of addressing a routing slip, have adopted the practice of using the response card as an address card, simply attaching it to the copy of the document before entering it into the mail system. This practice, however, interferes with the evaluation of response statistics. A certain fraction of response cards which indicate that announcements are of interest are either returned late, or, since the participant has to take the responsibility of returning the same card twice, are not returned at all.

As these are all positive responses, it can not be assumed, as is done in some SDI systems, that non-returned response cards should be considered as representing no-interest announcements.

Librarians also have the problem of identifying the item requested. Only accession numbers appear on response cards as document identification. This is sufficient for pulling microfiche on file, but most full-text items announced in STAR and IAA are not kept on file by the accession number. This is notably true of the journal articles announced in IAA. Items could be identified by referring to accession cards or to the journal issues, a time-consuming operation. In order to aid in this identification, at least one NASA Center library has asked its SDI participants to send the abstract card to the library with the response card when requesting a document. When the document request is filled, the abstract card is returned to the requestor.

Microfiche. SDI would not be practical unless the participant could obtain promptly the full text of the announced report or journal article. Even the present NASA SDI developmental system has 700 participants located at 21 research centers. Some of these centers are so large in area as to have more than one library facility. To have an original copy of each document at each point of need is manifestly impossible. NASA SDI here takes advantage of a basic tool that has been adopted for the rapid communication of scientific and technical information to all NASA's audiences: the negative, unitized flat microform known as microfiche.

Microfiche of reports are prepared by the NASA Facility. Incoming reports are first microfilmed at an 18-to-1 reduction, arranged in a 105 x 148 mm (approximately 4 x 6 inch) format, and a master transparent diazo negative is prepared. Multiple diazo copies are then made for widespread distribution.

The 4 x 6 microfiche has been adopted as standard by most Government agencies. It can hold 60 page images, with three images devoted to eye-legible information for guidance of the user. Seventy-two additional page images can be placed on each trailer fiche. Continuous quality control assures that even a third or fourth generation microfiche can serve as a master for further duplication or blow-back reproduction. Negative rather than positive microfiche was decided upon because heavy field use was anticipated for reproduction. Microfiche of reports are widely distributed to NASA Centers and contractors, other Government agencies, and domestic and foreign libraries. They are sold to the public by the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia.

In contrast to the availability of reports in the convenient microfiche form, journal articles are not so readily available in this form because of the copyright problem. However, the American Institute of Aeronautics and Astronautics, by special arrangements, manufactures and sells microfiche of about 50% of all the items announced in IAA. Microfiche of documents announced in IAA are not available from NASA. Organizations other than NASA Centers must arrange with the AIAA for their own purchase or subscriptions.

Availability of microfiche is indicated by a "#" symbol following the accession number (Figs. 18 and 20). This appears in the abstract journal, on the abstract card, and on the response card.

Demand on library services. Establishment of an SDI program at a research center has invariably been followed by a large increase in the demands placed on the local library service. This is understandable. Consider the individual who has just opened an SDI announcement and finds it to be of interest. Will he order a full-text copy? All he needs to do is put a pencil point down on the "Of interest, document requested" block, punch it out, and toss the response card in his outbox. It is preaddressed on the back to his local library. Certainly he will order more documents than someone who must search the literature himself, locate a library request form,

telephone the library, or write a memorandum. Experience suggests that the average SDI participant requests three times as many items from the library as non-participants do. Even so, SDI users do not order documents carelessly. In fact, only 10 to 20 per cent of announcements lead to document requests. Instead, the increase seems to be clear evidence that the typical scientist or engineer had not previously been making adequate use of the literature and had not had a simple, easy method of requesting library material.

The increased demand on library services must, of necessity, be filled by copies of the original document; that is, by reproductions, more-or-less full-sized, or by microcopy. Within NASA, as its Centers are semi-autonomous in their operations and vary greatly in staff and facilities, library practices in filling requests also vary. In general, requests are filled by microfiche wherever possible. Some NASA Centers file sufficient microfiche copies to fill anticipated requests, simply pulling one copy as needed. Other Center libraries keep only a master microfiche, and duplicate a copy to forward to the requestor as needed.

Since NASA SDI was initiated, there has been a dramatic positive change in the general user acceptance of microfiche. Partly, this is the result of increased availability of microfiche readers. Individuals who once had little favorable to say about microcopy of any type, now find it convenient to take a quick look at a microfiche, which is often enough for their purposes.

If the microfiche recipient still needs an eye-legible copy, this is furnished on request. Some libraries are able to meet all demands for large copy by blowback from microfiche. In addition to filling requests by their own duplication activities, NASA libraries may also request copies of reports from the NASA Facility. If reproduction is needed, the Facility uses the microfiche as a source to produce two images each on an 8 1/2 x 11 inch sheet of photographic paper. Experience to date has indicated little objection to this less-than-full-size (60%) image, primarily because of its superior quality in comparison to that of copies prepared by other common reproduction methods.

SECTION 9

SYSTEM EVALUATION

Each NASA SDI announcement has been accompanied by a response card (Fig. 18), which serves a variety of useful purposes: address card, document order form, comment card, and source of a quantititive measure of the quality of service being provided the participant. By compiling the responses ("Of interest, etc.") punched by the recipients of announcements, the NASA SDI operator can determine which individuals are receiving unsatisfactory service (a low percentage of hits), and therefore need assistance in profile revision. By comparing responses to time-sequenced batches of announcements, as from successive issues of the associated abstract journals, the operator can evaluate the effects of profile changes.

Response card processing. Deciding the extent to which response evaluation should be carried poses questions of utility and cost effectiveness, particularly in view of the large number of response records that must be sorted. With 700 NASA SDI participants, returned responses total about 35,000 cards during each twice-monthly operating period. Sorting these by Center, participant's name, each of the four possible responses, and journal issue requires significant time on either EAM equipment or internally in a computer.

The following simple procedure has been used to obtain (1) a measure of overall system effectiveness and (2) a measure of the degree of personal satisfaction with the system being experienced by selected individuals. All returned response cards (14 or 15 tab card boxes) are sorted twice monthly on an EAM sorter. The cards for each individual are then tallied on an accounting machine. A sample page of the resulting tabulation is shown in Fig. 21. Total response figures for the overall system are also obtained.

With all its limitations, this tabulation finds steady use in evaluation of individual responses. Used in conjunction with user accession lists (Sect. 6) for a given journal issue, the tabulation is examined visually to alert the profile reviewer to individuals who are not returning response cards or who are indicating a low ratio of hits to announcements.

Ideally, responses from each participant should be tabulated for each issue's announcements, in both absolute numbers and calculated percentages. The number of returned response cards as a percentage of total announcements should also be indicated.

A POST program utilizing a 1401 card-to-tape routine, a 1410 sort, a 1410 main tabulation and format program (POST), and a 1401 print run to accomplish this evaluation has been considered, but programming effort has not been applied to date.

A second approach to full response evaluation could be through modification of a POST program already developed for the IBM 7090/94 data processing system. This program, documented in NASA CR-62021, pp. 209-14, tallies all user responses and maintains a historical notice-response file. Its output is illustrated in Fig. 22. In this figure, responses are indicated by a "+" for Of interest, document requested, a "-" for Of interest, document not wanted; a "0" for Have seen before, and a "2" for Of no interest. Reasons for the match are also indicated; two figures represents the percentage on which a match took place; "122" and "133" represent two-word and three-word phrase matches, respectively, "143" represents a phrase match on three words out of four; 300 indicates that a match took place on a must term; and 222 is the same as 122, the initial 2 indicating that the phrase had been musted (no longer done).

As may be seen, user responses are maintained and reported in document number order, not by user name. This is a consequence of emphasis in the parent IBM series of SDI systems on (1) use of second response cards (NASA CR-62020, p. 22) to be used as address and evaluation cards for requested documents (a procedure later dropped by the NASA SDI system), and (2) recording the number of copies of documents requested and copies remaining in stock (in the NASA SDI system an "infinite" number of available copies is assumed). Reprogramming to sort by user number or name, calculate percentages, and print-out statistics in suitable format would be necessary to utilize the POST program for full user response evaluation. No programming effort has been applied to date in this direction.

Number of announcements. How many announcements will be selected for each participant, and therefore, how many abstract cards must be prepared for the overall system, depends on many factors. Factors under the operator's control include (1) minimum percentage required for a "may" match, (2) the number of words required to match in longer phrases, and (3) most important, the degree of specificity written into the user interest profiles. Factors generally not under the operator's control include the number of citations in the journal issue and the number of subject index terms assigned to the document input.

Table III presents experience on the average number of announcements received by approximately 700 participants in the NASA SDI program during April 1 to August 30, 1965, a period when operating conditions and the nature of the profiles were relatively constant.

Return of response cards. For a meaningful evaluation of user responses, the return of almost all response cards is crucial. Experience has shown the difficulty of obtaining a good rate of return. Table IV lists the percentages returned by July 15, 1965, of all cards distributed since January 1, 1965, by approximate date

Table III

Rate of Announcement Distribution

IAA				STAR			
Issue No. (1965)	Citations	Announcements per user	Announcements per user per 1000 citations	Issue No. (1965)	Citations	Announcements per user	Announcements per user per 1000 citations
7	1419	36.5	25.7	7	1149	29.6	25.8
8	1089	29.2	26.8	8	1116	28.2	25.3
9	1313	37.7	28.4	9	1496	37.4	24.8
10	1020	25.3	24.8	10	1019	26.0	25.5
11	1001	25.9	25.9	11	1057	27.2	25.4
12	1001	26.3	26.2	12	1152	29.0	25.1
13	1215	32.1	26.4	13	1018	25.6	25.1
14	1017	26.7	26.3	14	1159	26.6	22.9
15	1222	28.9	23.6	15	1107	23.0	20.8
16	1016	24.2	23.8	16	1317	26.4	20.3

Table IV

Rate of Returned Response Cards

IAA			STAR		
Issue	Date (1965)	Per cent Returned	Issue	Date (1965)	Per Cent Returned
1	Jan. 1	75	1	Jan. 8	77
2	Jan. 15	73	2	Jan. 23	75
3	Feb. 1	74	3	Feb. 8	80
4	Feb. 15	75	4	Feb. 23	86
5	Mar. 1	70	5	Mar. 8	73
6	Mar. 15	67	6	Mar. 23	65
7	Apr. 1	56	7	Apr. 8	57
8	Apr. 15	51	8	Apr. 23	58
9	May 1	60	9	May 8	59
10	May 15	55	10	May 23	52
11	June 1	39	11	June 8	45

of distribution. These figures should be recognized as the experience of an SDI system serving participants at 21 locations, with limited direct contact with participants. Card receipt and evaluation are also once removed from the individual user. That is, cards move from user to local library to system operator. An independent operation with all or most of its participants serviced by one library, which also would evaluate their responses, should find that meaningful response evaluations could be generated more promptly following the distribution of announcements.

System performance. A measure of SDI system effectiveness is the percentage of "hits" i.e., announcements of interest as related to the total number of announcements distributed. In practice, this percentage is calculated as the ratio of (1) the returned response cards that have been rated as of interest to (2) the total number of returned cards. For individual participants, hit percentages vary greatly, from 10 to 20 per cent for poorly conceived and inadequately reviewed interest profiles up to 80 to 85 per cent for well written profiles. A few individuals indicate interest in an even higher percentage of announcements they receive but these often have a very concise or otherwise unusual profile.

Average percentage responses for the overall system of 700 users during the first six months of 1965 showed the following ranges for announcements selected from individual journal issues:

	Per cent
1. Of interest, document requested	10 - 16
2. Of interest, document not wanted	33 - 43
3. Of interest, have seen before	2 - 4
4. Of no interest	38 - 48
Total of interest (hits)	52 - 62

It should be emphasized that these are percentages of returned response cards, not of total announcements distributed.

Costs. So many factors enter into the selection and distribution of an SDI announcement that it is difficult to estimate the cost of an operating system having a given number of participants, searching a certain number of citations, using particular equipment, etc. Actual costs will be a function of the number and type of participants, volume of input, degree of integration with other information programs, number of profile changes (which in turn is determined largely by the operator's interest in stimulating profile improvement), and computer availability, as well as administrative distribution of supervisory costs, computer operator time, and other expenses over a number of operations.

In Table V, some representative costs of an SDI system as it might be operated at approximately the size of the present NASA program are presented. The unit costs are based on actual experience with the NASA IBM 7090/94 program. The figures do

not provide for economies achieved by integration with other operations, such as the printing of additional abstract cards for other purposes, as has been done during operation of the NASA SDI program. This would reduce the unit costs shown. A substantial reduction in the unit cost of computer profile update and match would be gained by use of other than prime time on a 7090/94 computer, as is done by NASA. An announcement medium other than the abstract and response cards would alter the overall costs significantly.

The figures in Table V do not include direct labor for machine operation, other than 7090, since the manhour-per-machine-hour factor is variable among independent organizations, being dependent not only upon manning policy and configuration but also upon the efficiency of machine utilization. Supervision, which is also a function of management policy, is not included in any of the representative costs.

Table V

Representative NASA SDI Costs Per Announcement

Abstract preparation Includes photographic reduction of journal galleys and plate making	1.8¢
Abstract printing Includes offset plate preparation, printing and cutting	1.3¢
Computer update and match Rent of IBM 7094 assumed to be $500 per hour	5.6¢
Off-line machine operation 1410, 1401 and EAM used for response card punching, interpretation, and operational report printouts	0.9¢
Announcement assembly and dispatch Includes envelope insertion, boxing, mailing and amortization of envelope inserter	1.7¢
Profile editing and maintenance Includes profile review, correspondence, and keypunching change cards	1.8¢
Statistical response analysis Includes EAM sorting	0.4¢
Cost per announcement	13.5¢

APPENDIX A

AUXILIARY NASA SDI COMPUTER PROGRAMS

There are currently six 1401, and three 1410 programs in the SDI system. All the 1410 programs are sorts which utilize the standard 1410 operating system sort. Tape formats are available as part of the system documentation.

1. SDI 01 (1410)
   a. Sorts the NOTICE output tape from the 7094 MATCH program.
      MAJOR DOCUMENT NUMBER
      MINOR CENTER (LOCATION)
   b. The output of this sort is utilized by programs SDI 10, SDI 11, and FORMT.
   c. Approximate run time per 15,000 notices - 15 Min.

2. SDI 02 (1410)
   a. Sorts the NOTICE output tape from the 7094 MATCH program.
      MAJOR USER NUMBER
      MINOR DOCUMENT NUMBER
   b. The output of this sort is utilized by SDI 12.
   c. Approximate run time per 15,000 notices - 20 Min.
   d. Tape formats are identical to SDI 01.

   In that the program SDI 12 (see below) is no longer required, SDI 02 is not currently in operation.

3. SDI 03 (1410)
   a. Sorts the NOTICE output tape from the 7094 MATCH program.
      MAJOR CENTER (LOCATION)
      INTERM USER LAST NAME (1st 10 digits)
      MINOR DOCUMENT NUMBER
   b. The output of this sort is utilized by SDI 13.
   c. Approximate run time per 15,000 notices - 20 Min.
   d. Tape formats are identical to SDI 01.

   All 1410 sorts could be run on a 1401 with at least four tape drives and an 8K core storage should no 1410 be available. However, a 1410 can perform the sorts 30-40% faster.
   Any 1410 configuration having at least 5 tape drives can handle these sorts.

4. SDI 10 (1401)
   a. This program lists on the 1403 printer a double columnar arrangement indicating:
      1. The total number of notices generated for each document.
      2. The total number of abstract cards to be produced for each document.

      Currently, the figure for 2. is the total for 1. + 50. The total of all notices produced for all documents is also provided. See Section 6 and Figure 9.

   b. Input file is the output of SDI 01.
   c. Approximate run time - 15 Min.

5. SDI 11 (1401)
   a. This program punches the notices into the blue response cards. The two digit issue number, as supplied by a control card, is punched in columns 72 and 74.

      If the document microform code is a 1, it is replaced for interpretation by a "#." If the code is other than 1, it is removed.

   b. Input file is the output of SDI 01.
   c. The response card format is shown in Figure 19.
   d. Approximate run time - 200 notices/minute.

6. SDI 12 (1401)
   a. This program produces a listing on the 1403 printer which is a breakdown by each user of those notices (documents) which have been selected from the current issue. In addition, a reason for the notification is also indicated, i.e., whether the notice is the result of a MAY percentage, a MUST or a PHRASE (2 out of 2, 3 out of 3, etc.). See Section 6.
   b. Input file is the output of SDI 02.
   c. Approximate run time for 15,000 notices - 30 Min.
   d. The need for this program has been obviated by SDI 13 so it was discontinued as of Issue 08.

7. SDI 13 (1401)
   a. This program is identical to SDI 12 except that the user-document breakdown is found within the NASA centers. See Section 6 and Figure 10.
   b. Input file is the output of SDI 03.
   c. Approximate run time for 15,000 notices - 30 Min.

8. FORMT (1401)
   a. This program converts the sorted notices, output of SDI 10 (short form)into a format acceptable to the 7094 POST program (long form).
   b. Input file is the output of SDI 01.

c. Output file is input to POST.
d. No running times are available.

9. NPOST (1401)
   a. This program takes the NOTICE cards returned by the users (now referred to as RESPONSE cards) as well as any necessary control cards, and loads them onto tape as input to the POST program. Detailed write up is found in report NASA CR-62021, pp. 203-208.
   b. No run times are available.

All 1401 programs can be run on a system consisting of: 8K core, two 7330/729 tape drives, 1402 reader-punch, 1403 printer, and Advanced Programming Package. If sorting is to be done on the 1401, 4 tape drives are required.

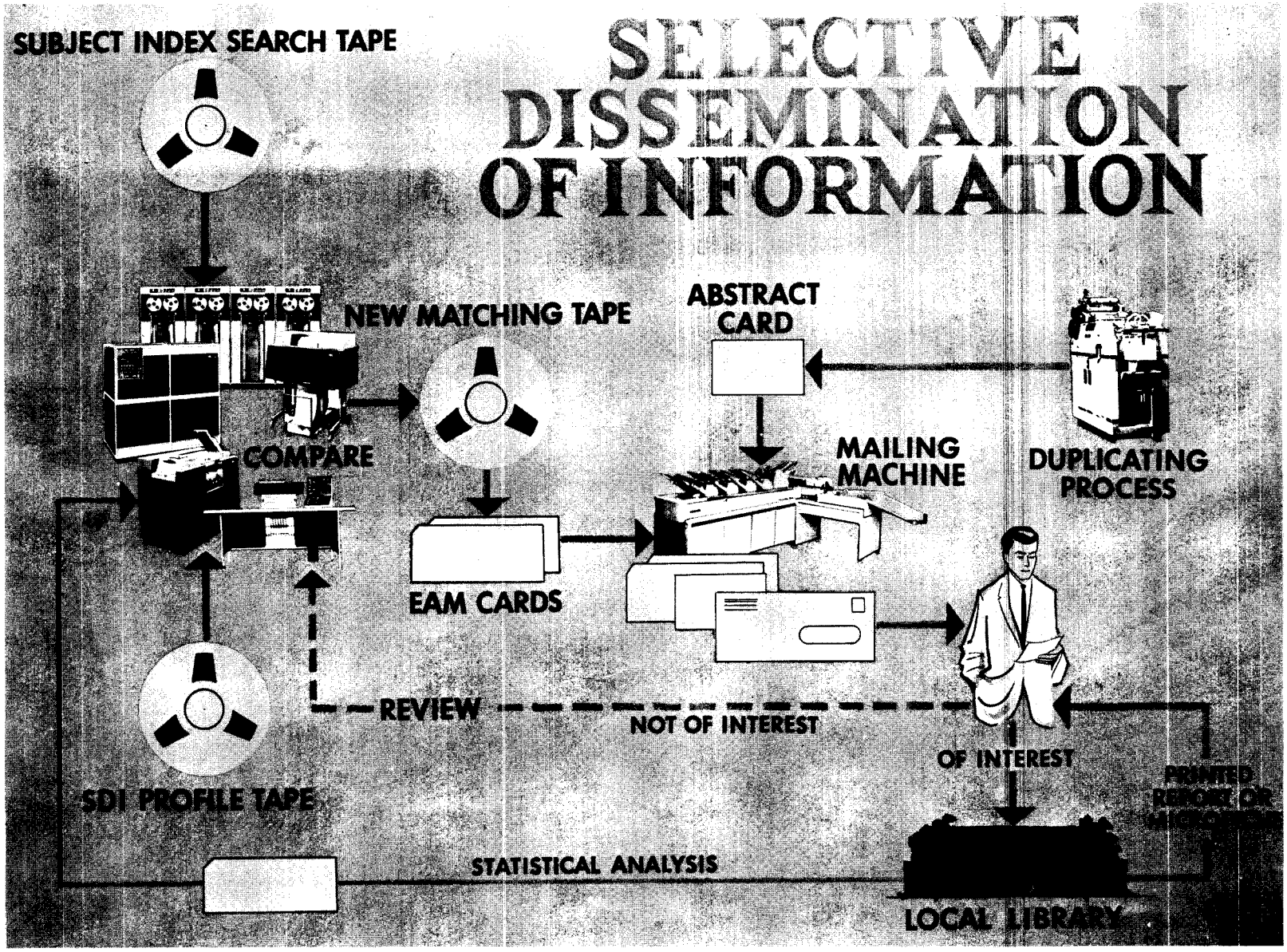

SELECTIVE DISSEMINATION OF INFORMATION
SUBJECT INDEX SEARCH TAPE
NEW MATCHING TAPE
ABSTRACT CARD
COMPARE
MAILING MACHINE
DUPLICATING PROCESS
EAM CARDS
REVIEW
NOT OF INTEREST
OF INTEREST
SDI PROFILE TAPE
STATISTICAL ANALYSIS
LOCAL LIBRARY

Figure 1

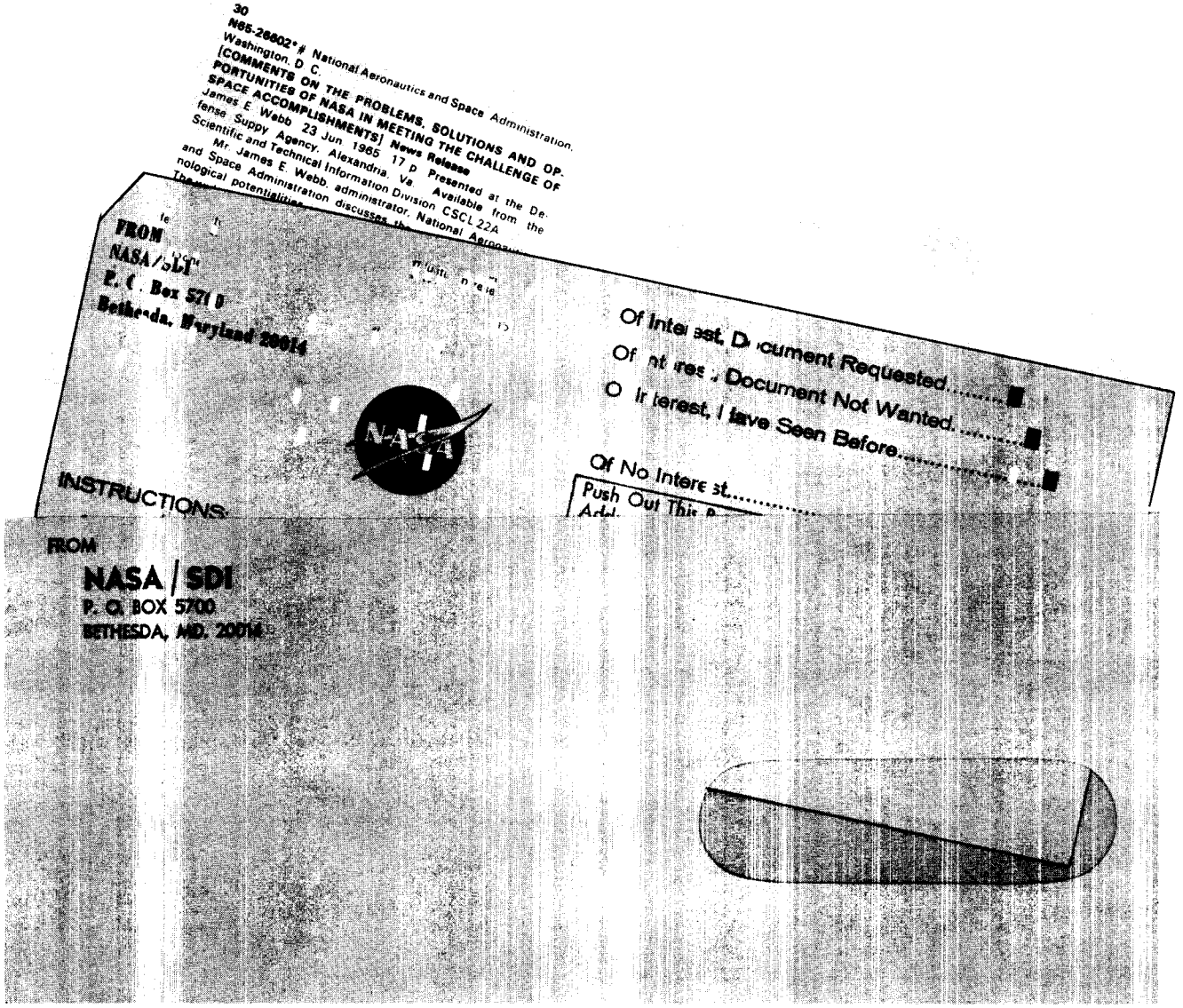


Figure 2. NASA/SDI Sample Announcement

NASA/SDI INTEREST PROFILE

USER NUMBER
Do not write in this space

NAME _____ TELEPHONE NO. _____

CENTER OR ADDRESS _____ INTERNAL MAILING ADDRESS _____

_____ _____

JOB TITLE _____

SECTION _____ BRANCH _____ DIVISION _____

DOES THIS PROFILE REPRESENT THE INTERESTS OF MORE THAN ONE INDIVIDUAL? _____
Number to whom you will distribute your announcements: _____

(This will be of assistance in reviewing the specific profile descriptors entered below.)
BRIEF STATEMENT OF YOUR INTERESTS:

INTEREST PROFILE DESCRIPTORS
(It is suggested that you consult the NASA/SDI brochure describing profile preparation as well as the Guide to the Subject Indexes for STAR. Your local librarian can be of assistance. If additional space is required, please continue on additional sheets and attach.)

PHRASES
(These should be two to seven words long. Three-word phrases are probably best. This is the important part of your profile. See brochure.)

FFNo 663 August 65

Figure 3. Interest Profile Submission Form (Front)

MUST TERMS:
(Single words only; avoid musting words with multiple meanings or general terms which might result in many irrelevant notices. See brochure.)

M _____ M _____ M _____
M _____ M _____ M _____

MAY WORDS:
(Single words that only take part in percentage matching—along with all other words in phrases.)

_____ _____ _____
_____ _____ _____

NOT PHRASES:
(Two to seven words long; good way to forestall no-interest announcements.)

N _____ N _____
N _____ N _____
N _____ N _____

NOT TERMS:
(Single words only; caution is suggested here. The user should be aware of the fact that a single NOT term will override all other match criteria and prevent a "hit".)

N _____ N _____ N _____
N _____ N _____ N _____

MUST CONTRACT OR GRANT NUMBERS:
(As special descriptors, contract numbers are prefixed by a "C".)

C _____ C _____
C _____ C _____
C _____ C _____

NOT CONTRACT OR GRANT NUMBERS:
(Specific contract or grant numbers which are known to be of no interest; enter preceded by a "D".)

D _____ D _____
D _____ D _____

NOT FOREIGN LANGUAGE DOCUMENTS:
(If announcements of documents in languages other than English are not wanted, write "Not Foreign-Lang" in the following space.)

_____

NOT INTERNATIONAL AEROSPACE ABSTRACTS:
(If you do not want to receive any announcements from IAA, write "Not IAA" in the following space.)

_____

Figure 4. Interest Profile Submission Form (Back)

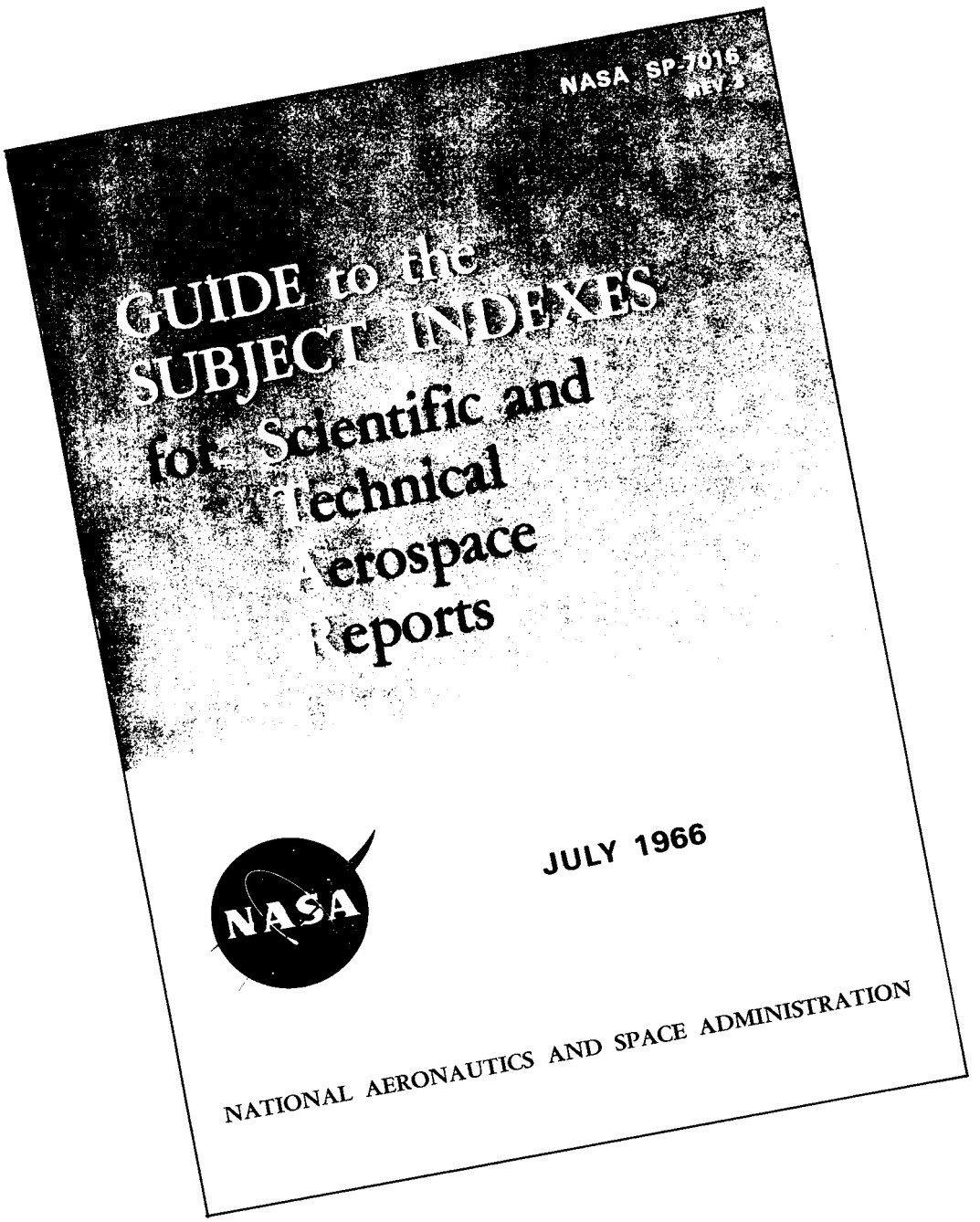
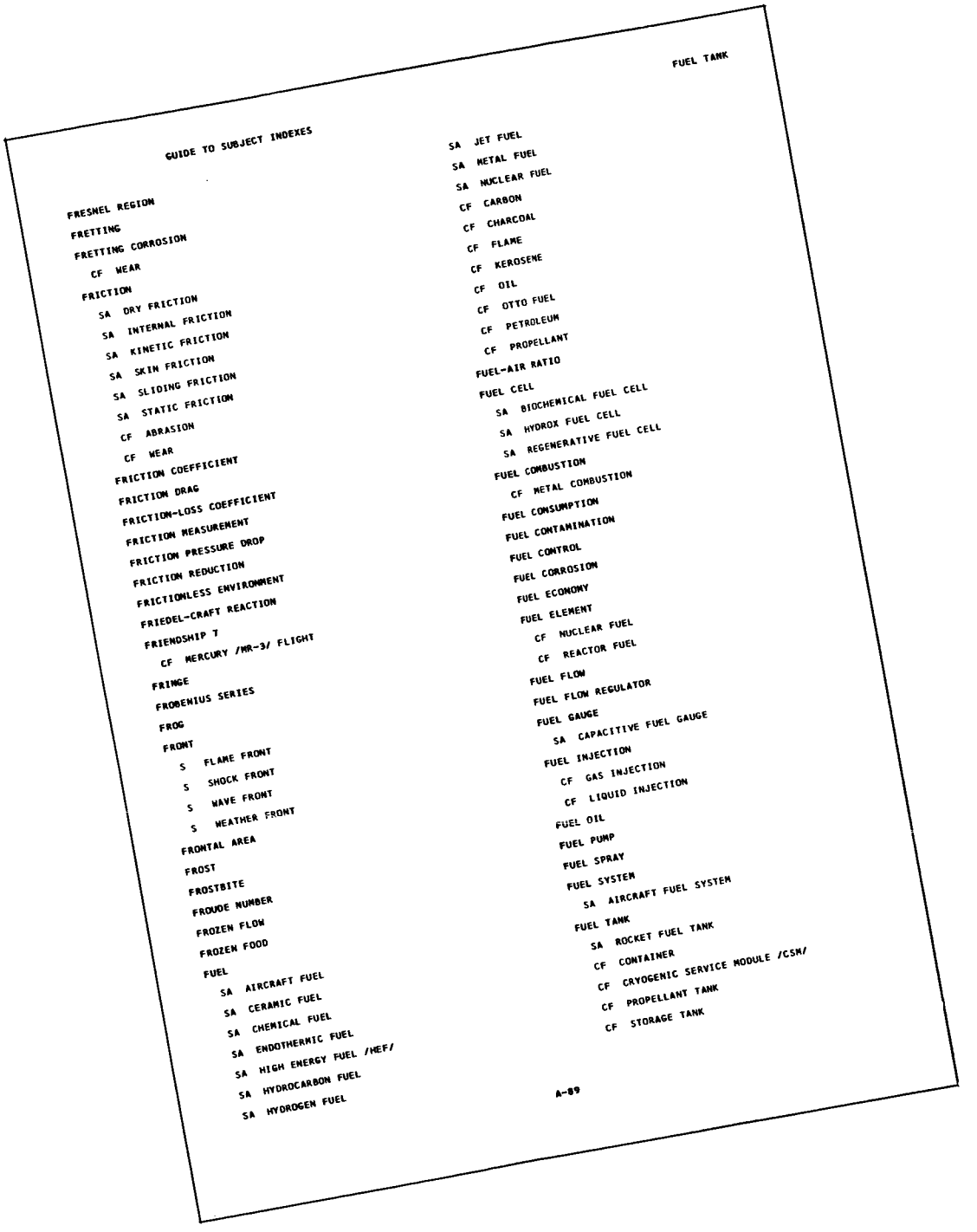


Figure 5. Guide to Subject Indexes for STAR



GUIDE TO SUBJECT INDEXES

FUEL TANK

FRESNEL REGION
FRETTING
FRETTING CORROSION
  CF WEAR
FRICTION
  SA DRY FRICTION
  SA INTERNAL FRICTION
  SA KINETIC FRICTION
  SA SKIN FRICTION
  SA SLIDING FRICTION
  SA STATIC FRICTION
  CF ABRASION
  CF WEAR
FRICTION COEFFICIENT
FRICTION DRAG
FRICTION-LOSS COEFFICIENT
FRICTION MEASUREMENT
FRICTION PRESSURE DROP
FRICTION REDUCTION
FRICTIONLESS ENVIRONMENT
FRIEDEL-CRAFT REACTION
FRIENDSHIP 7
  CF MERCURY /MR-3/ FLIGHT
FRINGE
FROBENIUS SERIES
FROG
FRONT
  S FLAME FRONT
  S SHOCK FRONT
  S WAVE FRONT
  S WEATHER FRONT
FRONTAL AREA
FROST
FROSTBITE
FROUDE NUMBER
FROZEN FLOW
FROZEN FOOD
FUEL
  SA AIRCRAFT FUEL
  SA CERAMIC FUEL
  SA CHEMICAL FUEL
  SA ENDOTHERMIC FUEL
  SA HIGH ENERGY FUEL /HEF/
  SA HYDROCARBON FUEL
  SA HYDROGEN FUEL
  SA JET FUEL
  SA METAL FUEL
  SA NUCLEAR FUEL
  CF CARBON
  CF CHARCOAL
  CF FLAME
  CF KEROSENE
  CF OIL
  CF OTTO FUEL
  CF PETROLEUM
  CF PROPELLANT
FUEL-AIR RATIO
FUEL CELL
  SA BIOCHEMICAL FUEL CELL
  SA HYDROX FUEL CELL
  SA REGENERATIVE FUEL CELL
FUEL COMBUSTION
  CF METAL COMBUSTION
FUEL CONSUMPTION
FUEL CONTAMINATION
FUEL CONTROL
FUEL CORROSION
FUEL ECONOMY
FUEL ELEMENT
  CF NUCLEAR FUEL
  CF REACTOR FUEL
FUEL FLOW
FUEL FLOW REGULATOR
FUEL GAUGE
  SA CAPACITIVE FUEL GAUGE
FUEL INJECTION
  CF GAS INJECTION
  CF LIQUID INJECTION
FUEL OIL
FUEL PUMP
FUEL SPRAY
FUEL SYSTEM
  SA AIRCRAFT FUEL SYSTEM
FUEL TANK
  SA ROCKET FUEL TANK
  CF CONTAINER
  CF CRYOGENIC SERVICE MODULE /CSM/
  CF PROPELLANT TANK
  CF STORAGE TANK

A-89

Figure 6. Guide to Subject Indexes for STAR

VOCABULARY LISTING JANUARY 3, 1966

	ALPHA TERM	TYPE	POST	PUB	MACH	62	63-A	-N	-X	64-A	-N	-X	65-A	-N	-X	TOTAL
	PRECAMBRIAN	1			13	1							4	5	3	13
	PRECAUTION	1			20	2	1	6		1	3		1	3	3	20
	PRECESSION	3		23	114	22	12	10	5	23	18	3	29	11	4	137
	PRECIOUS STONE ROCKET	1			2					2						2
	PRECIPITATION	3		161	614	79	59	94	24	54	119	17	132	174	23	775
	PRECIPITATION HARDENING	3		35			4			8	2	1	15	4	1	35
	PRECIPITATION PARTICLE MEASUREMENT	3		50			1			3	3		27	14	2	50
	PRECISION	3		49	464	31	27	62	15	44	83	27	64	108	52	513
	PRECONDITIONING	1			5	1			1				1	1	1	5
	PRECOOLING	1			11	2		3			1	2	1	2		11
	PRECORDIUM	3		4	3				1	4	2					7
	PRECURSOR	1			48	2	3	6	3	8	4	2	8	8	4	48
	PREDETECTION	1			20	1	3	1		4	2		6	2	1	20
	PREDICTAND POINT	1			2	2										2
NO	PREDICTION	3	P		1573	159	74	165	81	109	226	79	173	336	171	1573
	PREDICTION RECORDING	3		3	1		1				2			1		4
	PREDICTION THEORY	3		64				1		3	4	5	9	27	15	64
	PREDICTOR	3		9	37	10	4	5	5	1	7		3	9	2	46
	PREEMPTING	* 3			1	1										1
	PREFERENCE	1			23	2	1	3		2	2	1	6	3	3	23
	PREFIRING	1			4	1			1					2		4
	PREFLIGHT	1			105	2	7	10	15	4	5	14	11	11	26	105
	PREFLIGHT ANALYSIS	3		22	1		2	1	1		1	1	3	3	11	23
	PREFLIGHT OPERATION	3		13			2	1	1	1		3	1	1	3	13
	PREFOCUS	* 3			1	1										1
	PREFORM	1			18	1	1	4	1	1	3	1	1	5		18
	PREGL METHOD	* 3			1	1										1
	PREGNANCY	1			7					1	1	1	2	2		7
	PREGNANE	1			1					1						1
	PREGNANT	1			10	2		6		1	1					10
	PREHARDNESS	* 3			1	1										1
	PREHEATER	1			6	1		2	1		1		1			6
	PREHEATING	1			22	5	3	3		1	2		2	4	2	22
	PREIMPREGNATION	3		9	7	6	1	2	5	2						16
	PREJUDICE	* 3			1	1										1
	PRELAUNCH	1			116	11	16	14	13	1	3	13	13	13	19	116
	PRELAUNCH PROBLEM	3		17		1	2	4		1		1	3	1	4	17
	PRELAUNCH TESTING	3		40			6	3	1	1	1	5	8	4	11	40

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Figure 7. Subject Authority List

PENTANONE	026300462110	026300462110	061964	000000	2	0
PENTOBARBITAL	062557417710	062557417710	061964	000000	1	0
PENTODE	630045634610	630045634610	061964	000000	1	0
PENTOLITE	041426464610	041426464610	061964	000000	3	0
PENTON	022545634610	022545634610	061964	000000	1	0
PENTOXIDE	201461464610	201461464610	061964	061964	4	1
PENUMBRA-UMBRA*RATIO	160426314620	160426314620	061964	000000	1	0
PEOPLES, R. G.	144746474330	144746474330	090264	000000	1	0
PEPPER	162547472510	162547472510	061964	000000	3	0
PEPSIN	022547623110	022547623110	061964	000000	1	0
PEPTIDASE	630425463110	630425463110	061964	000000	1	0
PEPTIDE	630047633110	630047633110	061964	061964	4	2
PERCENTAGE	024670040010	024670040010	061964	000000	7	0
PERCEPTION	004660656011	004660656011	000000	061964	0	1
PERCEPTION*HUMAN	302224442520	302224442520	000000	71864	0	1
PERCEPTION*STIMULATION	640432104220	640432104220	000000	061964	0	1
PERCEPTRON	004600656010	004600656010	061964	061964	7	4
PERCHLORATE	216300025310	216300025310	061964	073064	36	3
PERCHLORATE*OXIDIZER	162160266220	162160266220	000000	073064	0	1
PERCHLORIC*ACID	254031361320	254031361320	061964	000000	3	0
PERCHLORYL*FLUORIDE	130441152220	130441152220	061964	081364	2	1
PERCOLATION	410432120010	410432120010	061964	000000	1	0
PERCUS*METHOD	450032132220	450032132220	061964	000000	2	0
PERCUSSION	254760652110	254760652110	A 03	000000	2	0
PERCY, J. L.	452551237030	452551237030	092164	000000	2	0
PEREK, L.	042551254220	042551254220	090264	000000	2	0
PEREKATOV, V. I.	324617404230	324617404230	090964	000000	2	0
PERETTI, J.	651451256320	651451256320	090964	000000	1	0
PEREY, F. G.	462551257030	462551257030	090264	000000	1	0
PERFECT	644651262510	644651262510	061964	000000	21	0
PERFECT*GAS	436733262520	436733262520	061964	000000	5	0
PERFECTLY*DIFFUSE*REFLECTION	501423752130	501423752130	000000	061964	0	1
PERFECTLY*DIFFUSE*RADIATION	104256046030	104256046030	000000	061964	0	1
PERFLEX	624251264310	624251264310	061964	000000	1	0
PERFLUORO	236300604310	236300604310	061964	000000	5	0
PERFLUORO*ACID	024031444320	024031444320	061964	000000	1	0
PERFLUOROALKANE	602121254710	602121254710	061964	000000	3	0
PERFLUOROALKYL	602170236210	602170236210	061964	000000	1	0
PERFLUOROBIGUANIDE	236041412411	236041412411	000000	073064	0	1
PERFLUOROCARBON	023222262510	023222262510	061964	000000	1	0
PERFLUOROETHANE	405321254310	405321254310	061964	000000	1	0
PERFLUOROPIPERIDINE	361560143510	361560143510	061964	000000	1	0
PERFLUOROPROPANE	572547414110	572547414110	061964	000000	1	0
PERFLUOROPROPYLENE	576062104710	576062104710	061964	000000	1	0
PERFORATED*PLATE	514713604720	514713604720	061964	000000	3	0
PERFORATION	530432170010	530432170010	061964	A 01	13	4
PERFORMANCE	336170636510	336170636510	061964	061964	1512	160
PERFORMANCE*CHARACTERISTICS	515145401720	515145401720	061964	000000	13	0
PERFORMANCE*HEALTH*BEHAVIOR	202730016330	202730016330	000000	061964	0	1
PERFORMANCE*PLASMA*ACCELERATOR	005053472430	005053472430	000000	71864	0	1
PERFORMANCE*PREDICTION	575364011120	575364011120	061964	000000	10	0
PERFORMANCE*PROPULSION	375207624420	375207624420	000000	061964	0	1
PERFUSION	251417636410	251417636410	061964	061964	1	1
PERGAMENT, H. S.	510014442130	510014442130	090964	000000	1	0
PERIA, W. T.	422551312130	422551312130	090264	000000	2	0
PERICENTER	626032147210	626032147210	000000	061964	0	1

Figure 8. Dictionary Printout

529142	19	529142	69
529143	24	529143	74
529144	9	529144	59
529145	11	529145	61
529146	4	529146	54
529147	9	529147	59
529148	8	529148	58
529149	8	529149	58
529150	25	529150	75
529151	4	529151	54
529152	20	529152	70
529153	6	529153	56
529154	7	529154	57
529155	14	529155	64
529156	14	529156	64
529157	26	529157	76
529158	15	529158	65
529159	26	529159	76
529160	5	529160	55
529161	24	529161	74
529162	15	529162	65
529163	5	529163	55
529164	40	529164	90
529165	7	529165	57
529166	22	529166	72
529167	9	529167	59
529168	24	529168	74
529169	23	529169	73
529170	16	529170	66
529171	3	529171	53
529172	4	529172	54
529173	9	529173	59
529174	13	529174	63
529175	43	529175	93
529176	28	529176	78
529177	12	529177	62
529178	5	529178	55
529179	1	529179	51
529180	11	529180	61
529181	13	529181	63
529182	3	529182	53
529183	40	529183	90
529184	5	529184	55
529185	10	529185	60
529186	15	529186	65
529187	22	529187	72
529188	19	529188	69
529189	21	529189	71
529190	26	529190	76
529191	35	529191	85
529192	20	529192	70
529193	10	529193	60
529194	11	529194	61
529195	16	529195	66
529196	43	529196	93

Figure 9. Frequency List

USER NOTICES DISTRIBUTED BY THE NASA SELECTIVE DISSEMINATION OF INFORMATION SYSTEM
HOU STAR18 MINIMUM MATCH FOR MAY - 50% 07SEP65

G.W.	AMY	001500 HOU EE5	529187 PHR 2,2 529197 PHR 2,2 529464 PHR 2,2 529530 PHR 2,2 529568 PHR 3,4 529569 PHR 3,4 529570 PHR 2,2 529571 PHR 2,2 529670 PHR 2,2 529672 PHR 2,2 529683 PHR 2,2 529696 PHR 2,2 529770 PHR 2,2 529789 PHR 2,2 529813 PHR 2,2 529898 PHR 2,2 529911 PHR 2,2 529941 PHR 2,2 530054 PHR 2,2 530061 PHR 2,2 530164 PHR 2,2 530174 PHR 2,2 NUMBER OF NOTICES 22
W.A.	ANDERS	000520 HOU ASTRONAUT OFFICE	529168 PHR 2,2 529175 PHR 2,2 529186 PHR 2,2 529225 PHR 2,2 529249 PHR 2,2 529289 PHR 2,2 529374 PHR 2,2 529394 PHR 2,2 529487 PHR 2,2 529496 PHR 3,3 529514 PHR 2,2 529517 PHR 2,2 529559 PHR 3,3 529560 PHR 2,2 529576 PHR 3,3 529584 PHR 3,3 529623 PHR 2,2 529655 MAY .57 529681 PHR 2,2 529685 PHR 2,2 529741 PHR 3,3 529750 PHR 2,2 529751 PHR 2,2 529807 PHR 2,2 529966 PHR 2,2 530188 PHR 2,2 NUMBER OF NOTICES 26
M.	APPEL	001700 HOU ROOM 126-B SITE 5	529296 PHR 2,2 529426 PHR 2,2 529505 PHR 3,4 529614 PHR 3,4 529630 PHR 2,2 529631 PHR 2,2 529658 PHR 2,2 529683 MAY .55 529687 PHR 2,2 529697 MAY .55 529699 PHR 2,2 529711 PHR 3,5 529771 MAY .50 529806 PHR 2,2 529864 PHR 3,4 529964 PHR 2,2 NUMBER OF NOTICES 16
P.J.	ARMITAGE	002800 HOU FL	529166 PHR 2,2 529249 PHR 2,2 529274 PHR 2,2 529347 PHR 2,2 529379 PHR 2,2 529399 PHR 2,2 529413 PHR 2,2 529428 PHR 2,2 529483 PHR 2,2 529596 PHR 2,2 529685 PHR 2,2 529750 PHR 2,2 529759 MAY .50 529761 PHR 2,2 529762 PHR 2,2 529763 MAY .50 529764 PHR 2,2 529767 PHR 2,2 529796 PHR 2,2 529800 PHR 2,2 529809 PHR 2,2 529839 PHR 2,2 530030 PHR 2,2 530078 PHR 2,2 530079 PHR 2,2 530083 PHR 2,2 NUMBER OF NOTICES 26
C.	BERRY	007100 HOU AH	529249 PHR 2,2 529740 MAY .50 529751 MAY .50 529760 PHR 2,2 529768 MAY .50 529769 PHR 2,2 529782 PHR 2,2 529832 PHR 2,2 529841 PHR 2,2 530056 PHR 2,2 NUMBER OF NOTICES 10
J.	BILLINGHAM	007200 HOU EC6	529289 PHR 2,2 529510 PHR 2,2 529514 PHR 2,2 529517 PHR 2,2 529560 PHR 2,2 529576 PHR 2,2 529655 PHR 2,2 529678 PHR 2,2 529786 PHR 2,2 529816 PHR 2,2 529860 PHR 2,2 529957 PHR 2,2 NUMBER OF NOTICES 12
C.F.	BINGMAN	007300 HOU BM	529244 PHR 2,2 529279 PHR 2,2 529301 MUST 529404 PHR 2,2 529443 MAY .50 529479 PHR 2,2 529677 PHR 3,3 529688 PHR 3,4 529717 PHR 3,3 529789 PHR 2,2 529898 PHR 2,2 NUMBER OF NOTICES 11
J.R.	BRICKEL	006600 HOU CF32	529160 PHR 2,2 529190 MUST 529191 PHR 2,2 529239 MUST 529249 PHR 2,2 529274 MUST 529286 PHR 2,2 529296 PHR 2,2 529377 MUST 529384 MUST 529385 MUST 529394 MUST 529403 MUST 529421 MUST 529428 PHR 2,2 529433 PHR 2,2 529454 PHR 2,2 529462 PHR 2,2 529472 MUST 529483 PHR 2,2 529491 PHR 2,2 529524 PHR 2,2 529569 MUST 529584 PHR 2,2 529606 MUST 529614 PHR 2,2 529623 PHR 2,2 529648 MUST 529685 PHR 2,2 529697 PHR 2,2 529719 PHR 2,2 529769 MUST 529781 PHR 2,2 529786 PHR 2,2 529864 PHR 2,2 529873 MUST 529880 PHR 2,2 529906 MUST 529966 PHR 2,2 530036 MUST 530050 MUST 530070 PHR 2,2 530085 MUST 530134 MUST 530139 MUST 530153 MUST 530154 PHR 2,2 530156 PHR 2,2 NUMBER OF NOTICES 48

Figure 10. User Accession List

```
*USER      015320
     PICTURE RECØGNITIØN
     PATTERN RECØGNITIØN
     CLØUD SURVEILLANCE
     MANMADE
     VIDEØ SPACE
     ØBJECT RECØGNITIØN
*USER      01550A
     SPACE*FLIGHT*BIØLØGICAL*HAZARD
DESCRIPTØR 036250447414 DELETED FRØM PHRASE LIST.
DELETED FRØM HISTØRICAL PRØFILES
     MANNED SPACE BIØLØGICAL HAZARD
*USER      015800
     PRØTURBANCE
DESCRIPTØR 133736726471 NØT ØN SINGLE WØRD LIST. CANNØT DELETE.
*USER      016000
USER 016000 HAS NØ HEADER. ENTRIES NØT PRØCESSED.
  USER PRØFILE REJECTED    016000
*USER      016300
   USER HEADER--
     016300 M G DELDUCA          HEA              000000   UHC016300CØDE MTE FØBIOB
CHANGED FRØM--
     016300 M G DELDUCA          HEA        11    000000   UHC016300CØDE MTE
*USER      020820
     PAGEØS
*USER      023300
   USER HEADER--
     023300 R A FALANGA          LAN              000000   UHC023300MAIL STØP 214A
CHANGED FRØM--
     023300 R A FALANGA          LAN        11    000000   UHC023300MAIL STØP 214A
*USER      023800
     FØREIGN-LANG
*USER      025400
     FØREIGN-LANG
*USER      025700
     METEØRØLØGY
     CØMMUNICATIØNS
```

Figure 11. User Transaction List

U S E R P R Ø F I L E S U M M A R Y		
ØRIGINAL PRØFILES		728
ØRIGINAL PRØFILES DELETED		10
NEW PRØFILES ADDED		10
DESCRIPTØRS ACCEPTED	439	
DESCRIPTØRS REJECTED	3	
NEW PRØFILES REJECTED		6
DESCRIPTØRS ACCEPTED		
DESCRIPTØRS REJECTED		
ADDITIØNS TØ ØLD USER PRØFILES		74
DELETIØNS FRØM ØLD USER PRØFILES		38
ØLD DESCRIPTØR ADDS REJECTED		7
HEADER CHANGES		15
NEW TØTAL ØF USER PRØFILES		728

Figure 12. User Transaction Summary

```
          TRANSISTØR

DØCUMENT 525595156N1 1121221     3103652101121001 11 02  00301009000023066500000 ACCEPTED

DØCUMENT 525596156N1 1122221     0006652101121001 11 01  00301001000023066500000
          AERØDYNAMIC
          AERØDYNAMIC CHARACTERISTICS
          AERØELASTICITY
          CHARACTERISTIC
          DEFØRMATIØN
          DRAG
          INFLATABLE
          INFLATABLE STRUCTURE
          LIFT
          LØNGITUDINAL
          PARAGLIDER
          RATIØ
          RECØVERY
          SPACECRAFT
          STRUCTURE
          SYSTEM
          WIND TUNNEL

DØCUMENT 525596156N1 1122221     0006652101121001 11 01  00301001000023066500000 ACCEPTED

DØCUMENT 525597156N1 1122221     0006652101121001 11 01  0030103300002306650000O
          ALUMINUM
          CØNDUCTIØN
          CØNVECTIØN
          CØNVECTIVE HEAT TRANSFER
          DUCT
          FØURIER SERIES
          GRADIENT
          HEAT
          ISØTHERM
          NUCLEAR
          PLATE
          PØISSØN EQUATIØN
          REACTØR
          RECTANGLE
          TEMPERATURE
          THIN
          THIN WALL
          TRANSFER
          WALL
          WATER

DØCUMENT 525597156N1 1122221     0006652101121001 11 01  00301033000023066500000 ACCEPTED

DØCUMENT 525598156N1 1122221     0006652101121001 11 01  00201008000023066500000
          CØMPILER
          CØMPILER PRØGRAM
          CØNTRØL
          EVENT
          FØRTRAN
          IMPLEMENTATIØN
          INTERFACE
          LANGUAGE
          MØDULATIØN
          NASA PRØGRAM
          NETWØRK
          PERT PRØJECT
          PRØGRAM
          START
          TIME
```

Figure 13. Document Profile List

SUMMARY ØF ADDITIØNS AND DELETIØNS TØ DØCUMENT TAPE

A.	NUMBER ØF DØCUMENT PRØFILES	ACCEPTED	1107
1.	TØTAL NUMBER ØF DESCRIPTØRS	ACCEPTED	14678
2.	TØTAL NUMBER ØF DESCRIPTØRS	REJECTED	
B.	NUMBER ØF DØCUMENT PRØFILES	REJECTED	
1.	TØTAL NUMBER ØF DESCRIPTØRS	ACCEPTED	
2.	TØTAL NUMBER ØF DESCRIPTØRS	REJECTED	

BEGINNING ØF PHASE 8.

Figure 14. Document Profile Summary

A 06	AGENA PRØPULSIØN	025145244002
A 06	ATLAS AUTØPILØT	031446604252
A 06	ATLAS BØØSTER	026740543012
A 06	ATLAS PITCH PRØGRAM	000476625033
A 06	ATLAS TELEMETRY	067255174262
A 06	BØØSTER STEERING	054314447322
A 06	CØMMUNICATIØN SATELLITE	076212265442
A 06	ECCENTRIC ØRBITING GEØPHYSICAL ØBSERVATØRY	076226130374
A 06	ECHØ I SATELLITE	035333046433
A 06	ECHØ II SATELLITE	035023046433
A 06	EQUATØRIAL SATELLITE MISSIØN	040653762523
A 06	FLIGHT REENTRY EXPERIMENT	051357602613
A 06	LAUNCH PAD DØWN TIME	073776225234
A 06	NIMBUS SPACECRAFT VEHICLE	040277416013
A 14	ØGØ	146274600001
A 15	EØGØ	125462746001
A 15	CØMMUNICATIØNS SATELLITE	076212207442
A 15	ECCENTRIC GEØPHYSICAL ØBSERVATØRY	001366401543
A 15	TELEMETRY	146461255441
A 15	C BAND BEACØN	066046407463
A 15	ØGØ-A	146274621001
A 15	SYNCHRØNØUS CØMMUNICATIØNS /SYNCØM-II/ SATELLITE	001565641564

Figure 15. Active User Profile Report

061964	UNSTEADY*BØUNDARY*LAYER	005577603503
***** DELETED	A 13	
061964	VELØCITY*FLUCTUATIØN	053243454062
061964	VLASØVE*EQUATIØN	014700043252
***** DELETED	A 13	
061964	WALL*PRESSURE*FLUCTUATIØN	042434433473
A 06	CØLLISIØN PLASMA PRØCESS	002076247503
A 06	IØNIZATIØN CRØSS-SECTIØN	017141176672
A 06	PLASMA DIAGNØSTICS INSTRUMENTATIØN	012721514553
A 06	MAGNETIC	027100445251
***** DELETED	A 14	
A 13	AURØRA	700645146511
A 13	AURØRAL	700275146511
A 13	CRYSTAL	702127062631
A 13	MASER	744216225511
A 13	LASER	743216225511
A 13	MAGNETØSPHERE	702366002151
A 13	GEØMAGNETIC	723606327101
A 13	SØLAR	762464321511
A 13	IØNØSPHERIC	755766017531
A 13	DIØDE	724314624251
A 13	SEMICØNDUCTØR	747263155001
A 13	PØLYCRYSTALLINE	755751056271
A 13	SILICØN	724744331231

Figure 16. Historical User Profile Report

USER=03770C G L JOHNSTON HEA 19 JUNE 1965
SB

	PLANT PHYSIOLOGY		PLEURA PNEUMONIA COCCOMYCES
	BIOMEDICINE COMPUTER TECHNOLOGY		BIOMEDICINE MOLECULAR ENERGETICS
	AMINO ACID DIET		BIOLOGY TELEMETRY
	CRYOGENICS BIOLOGY	M	BIOPHYSICS
	RADIATION CHEMISTRY		SYNTHETIC DIET
	SELF REPLICATION SYSTEM		PROTEIN SYNTHESIS
	PLANETARY LIFE		J-BAND FORMATION
	EXTRATERRESTRIAL LIFE		EXTRATERRESTRIAL LIFE DETECTOR
	BIOLOGICAL SELF REPLICATION SYSTEM		RADIATION BIOLOGY
	NEURON CHEMISTRY		ENVIRONMENTAL BIOLOGY
	ENVIRONMENTAL EXTREME		PLANT BIOCHEMISTRY
	ASTRONAUT DIET SPACE	M	PORPHYRIN
M	HEMODYNAMIC	M	GNOTOBIOTICS
M	BIOCHEMISTRY	M	PHARMACOLOGY
M	NUCLEOTIDE	M	NEUROPHYSIOLOGY
M	RIBONUCLEIC		CELLULAR INCLUSION EVOLUTION
	FREEZE DRYING		GERM FREE
	STRESS CARDIOVASCULAR		STRESS PHYSIOLOGY
	STRESS BIOLOGY		DRUG PRESERVATION
	LOW TEMPERATURE BIOLOGY		
	EXTRATERRESTRIAL LIFE MOLECULAR ORGANIZATION		
	FREQUENCY SPECTRA		GENETIC CODE
	HILL REACTION		MOLECULAR BIOLOGY
	OPTICAL ROTATION		ORGANIC COSMOCHEMISTRY
	ORGANIC MATTER EVOLUTION		ORGANIC SYSTEM FREQUENCY SPECTRA
	ORGANIC SYSTEM REFLECTION SPECTRA		PLEUROPNEUMOCOCCUS
	POLYPEPTIDES SYNTHESIS		PORPHINES SYNTHESIS
	PROTEIN DETECTION		PYRROLES SYNTHESIS
	RNA		SPACE DIET
	THEORETICAL BIOLOGY		ADVANCED MICROSCOPY DESIGN
	AMINO ACIDS SYNTHESIS		ASTRONAUT DIET
M	BIOINSTRUMENTATION		BIOLOGICAL CLOCK
	BIOLOGICAL PHOTOSENSITIVITY		CELL DRYING
	CELL FREEZING		CELL SYNTHESIS
	CELLULAR INCLUSION SYNTHESIS		CELLULAR SYNTHESIS
	CIRCADIAN RHYTHM		DIURNAL RHYTHM
	DNA		ENZYMES EVOLUTION
M	EXOBIOLOGY		EXTRATERRESTRIAL LIFE DETECTION

Figure 17. Sample User Profile

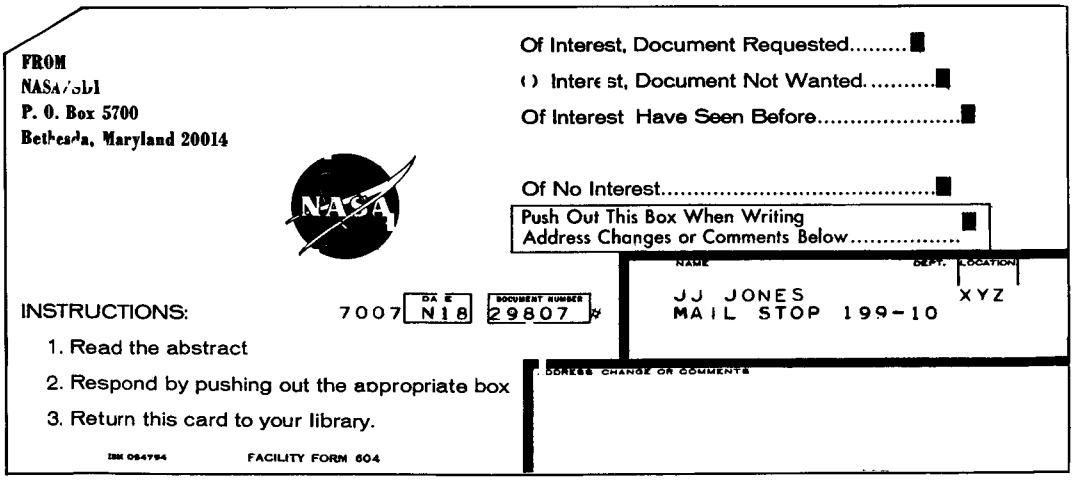

Figure 18. Response Card

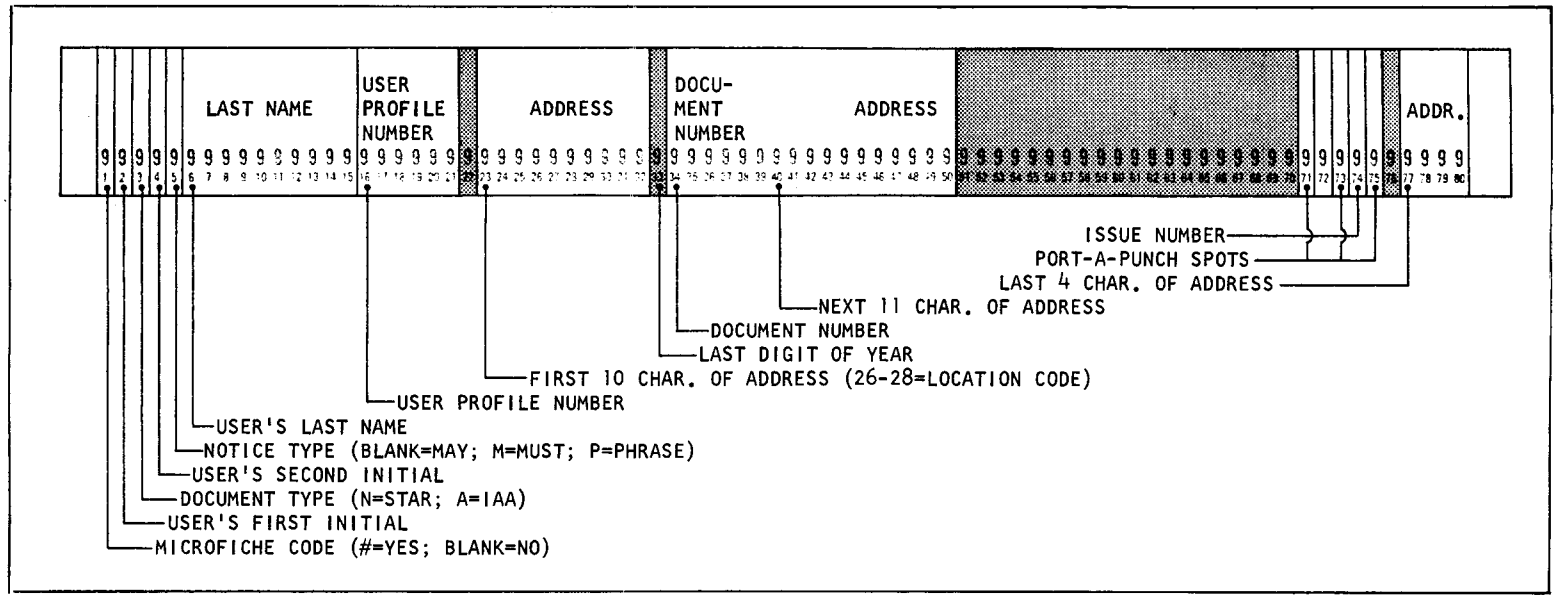

Figure 19. Response Card Format

N65-29807*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MANNED SPACE FLIGHT NETWORK POSTMISSION REPORT FOR RANGER C AND D
26 Jul. 1965 12 p
(NASA-TM-X-55243; X-552-65-307) CFSTI: HC $1.00/MF $0.50 CSCL 17B

Coverage of the orbital portions of the Ranger C and D missions through loss of signal (LOS) is analyzed. A brief critique of the performance of the Manned Space Flight Network (MSFN) for the two missions is presented with emphasis on troubles experienced. The general network requirements were to provide real-time computation support through injection and LOS, to provide C-band radar beacon tracking through LOS, and to receive and record the Agena telemetry link until battery decay or retromanuever. All of the MSFN stations that participated in the missions are listed. The network mission preparations are reviewed, and the performance of the basic on-station systems and the computing and ground communications systems are summarized. R.N.A.

Figure 20. Abstract Card

06/23/65

ISSUE NO	USER NAME	USER NUMBER	CTR	CC (total returned)	(1) of interest, document requested	(3) of interest, document not wanted	(5) of no interest	(7) of interest, have seen before	(9) Comment
A09	TRIMPI	78800	LAN	94	1		93		
A09	WHITTEN	85700	LAN	21	2	19			
A09	WILSON	85900	LAN	29	3	8	18		1
A09	YATES	91300	LAN	9		9			
A09	HAIGLER	30300	LAN	3			3		
				1307	195	529	566	16	16 **
A09	ACKER	30040	LEW	1	1				
A09	BROKAW	6200	LEW	44	1	10	30	3	
A09	BUCKLEY	6000	LEW	5	1		4		
A09	FRECHE	22900	LEW	1	1				
A09	HEIMEL	32100	LEW	1	1				
A09	INMAN	35220	LEW	17	1	15	1		
A09	JOHNSON	37600	LEW	1	1				
A09	KNIP	42100	LEW	22			22		1
A09	LALLI	46500	LEW	1	1				
A09	MORRIS	50500	LEW	74	66		8		
A09	ROSS	69300	LEW	1		1			
A09	ROWE	69400	LEW	1			1		
A09	RUBENSTEIN	70000	LEW	1	1				
A09	SHEIBLEY	70800	LEW	3			3		
				173	75	26	69	3	1 **
A09	C 2ST	6980A	WAS	41		41			
A09	DAVIS	1520A	WAS	18			18		1
A09	LAYTON	4530A	WAS	1			1		
A09	LORENZO	4860A	WAS	32		27		5	
A09	NORMAN, JR	5700A	WAS	11		8	3		
A09	S A C BST	70290	WAS	11		1	10		
A09	SIN	5030A	WAS	36		36			
A09	STONE	7390A	WAS	41		41			
				191		154	32	5	1 **
A09	ADAMCZAK	120A	WPB	24	9	3	12		
A09	BERKEY	420A	WPB	2	1		1		
A09	BIENIEWSKI	520A	WPB	51		20	31		
A09	BROOKS	960A	WPB	1			1		
A09	BURSON	1012A	WPB	6	1	5	1		
A09	CHARLESWOR	1110A	WPB	53	7	34	12		
A09	CRAIG	1240A	WPB	16	1	3	12		
A09	ELBAUM	2100A	WPB	3	1	1		1	
A09	FICKLER	2370A	WPB	2			2		
A09	GARSCADDEN	2520A	WPB	9		5		4	
A09	GRATZ	2900A	WPB	11	2		9		
A09	HUNT	3420A	WPB	6	6				
A09	KULP	4440A	WPB	2		2			
A09	MACH	4990A	WPB	1			1		
A09	MATTICE	5010A	WPB	37	1	20	16		

Figure 21. Statistical Response Tabulation

WNEPSCHAEFER	07050A	122	N 05	ACA	514825		P
DNRPYØUNG	091600	122	N 05	AME	514825		P
				5	514825	13	
TNEMGINDØRF	027900	300	N 00405	JPL	514826	-	M
DN PSHANKLAND	07350A	122	N 00405	WPB	514826	-	P
				2	514826		
WNFPBANGS	005400	122	N 00405	GDD	514826	2	P
JNRMDABBS	015300	300	N 00405	HUN	514826	2	M
SNLPØCHELTREE	057800	122	N 00405	LAN	514826	2	P
RNCPSHEARD	07090A	122	N 00405	WPB	514826	2	P
RNJPSTATTEL	072900	122	N 00405	GDD	514826	2	P
				5	514826		
HN MLESSØFF	046210	300	N 05	CAM	514826		M
RN MMCKANN	050800	300	N 05	HØU	514826		M
DNRMNØRDSTRØM	05590A	300	N 05	WPB	514826		M
				3	514826	10	
HNHPHEYSØN	031200	122	N 004050000	LAN	514827	+	P
				1	514827		
WNAPHØRN	033000	122	N 00405	HUN	514827	-	P
FNEPRØM	065200	122	N 00405	LEW	514827	-	P
				2	514827		
DN PADAMSØN	000300	122	N 00405	LAN	514827	2	P
BN MBAILIN	00410A	300	N 00405	GRI	514827	2	M
GNHPLUDWIG	049600	122	N 00405	GDD	514827	2	P
JNCPSANDERS	072600	122	N 00405	LEW	514827	2	P
LNWPSLIFER JR	073500	122	N 00405	GDD	514827	2	P
YNEPSTRAUSSER	075400	122	N 00405	LEW	514827	2	P
				6	514827		
DNWPBRØWN	009200	122	N 05	LEW	514827		P
RNJPDEBS	016200	122	N 05	AME	514827		P
JNTPFELDER	023800	122	N 05	HUN	514827		P
SNPPTRAK + DAT	S39380	122	N 05	SCA	514827		P
LN PKATZ	04040A	122	N 05	BFD	514827		P
JNLPMØDISETTE	052600	122	N 05	HØU	514827		P
HN PMAURER JR	053200	122	N 05	GDD	514827		P
DN PNØVIK	056000	122	N 05	HEA	514827		P
WNRPPERRY	061200	122	N 05	HUN	514827		P
WNCPSCØTT	071600	122	N 05	HEA	514827		P
MNRPSHARPE	072100	122	N 05	HUN	514827		P
HNEPSTAUSS	074900	122	N 05	HEA	514827		P
ENRPTEAGUE	075100	122	N 05	HUN	514827		P
WNMPTUCKER	076500	122	N 05	GDD	514827		P
JNMPWALKER	085600	122	N 05	HEA	514827		P
RNJPWISNIEWSKI	086200	122	N 05	HEA	514827		P
				16	514827	25	
KNLPBERKEY	00420A	122	N 00405	WPB	514828	-	P
				1	514828		
LNEPHØLNESS	033100	122	N 00405	EDW	514828	2	P
				1	514828		
HN PBURLAGE JR	009700	122	N 05	HEA	514828		P
JNWPWEETØN	085800	122	N 05	LEW	514828		P
				2	514828	4	
ENBPKØNECCI	041310	122	N 004050000	NAS	514829	+	P
				1	514829		
JNTPDEUEL	01550A	122	N 00405	WAS	514829	-	P
				1	514829		
RNEMCAMERØN	010800	300	N 05	JPL	514829		M
MNRPSHARPE	072100	122	N 05	HUN	514829		P
ANJPSHINER	073220	122	N 05	HEA	514829		P
DNRMYØUNG	091600	300	N 05	AME	514829		M
				4	514829	6	

Figure 22. POST Printout