NASA CR-62020

IMPLEMENTATION, TEST AND EVALUATION OF A SELECTIVE DISSEMINATION SYSTEM FOR NASA SCIENTIFIC AND TECHNICAL INFORMATION

FINAL REPORT

JUNE 1966

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ABSTRACT

Development of a large-scale selective dissemination of information (SDI) program, its experimental operation during the period November 1963 - August 1964, and program evaluation from September - December 1964 is reported. An IBM 7090/94 computer program compared user interest profiles with the subject indexes of reports announced in Scientific and Technical Aerospace Reports. Users were provided with selected announcements in the form of abstract cards. Profile preparation is described, and announcement and response media are illustrated. During the exploratory operation of the program, 500 NASA and 200 Air Force personnel served as participants and evaluators of the system. A statistical evaluation of system performance is included, and results of a questionnaire concerning user opinions and comments are presented. Program documentation and operation instructions are given in NASA CR-62021. Further program development and test operation of this SDI system until its transfer in February 1966 to operation on another computer system is reported in NASA TM X-57001.

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NASA PREFACE

Distribution of selected information to specific individuals is becoming of increasing importance as scientific and engineering staffs grow in number and as the volume of the literature makes it increasingly difficult and time consuming to keep abreast of current advances. In 1963, NASA contracted with the International Business Machines Corporation Advanced Systems Development Division for the design, programming, and test operation of a large scale developmental selective dissemination of information (SDI) system. This contractual program terminated in December 1964. The program phases undertaken during this period were preliminary operations in a continuing NASA developmental SDI effort.

This report presents details of the development and performance of the particular SDI system operated for NASA during the contractual period of the program. It describes the preparation of user interest profiles and illustrates the abstract cards and response cards received by system participants at that time. It also includes statistics on system performance, and presents the results of a questionnaire concerning user opinions and comments.

Documentation in the form of flow charts, record formats, and operating instructions are presented in report NASA CR-62021, Program Documentation for a Selective Dissemination System for NASA Scientific and Technical Information, issued June 1966. As documented in this report, the operation requires an IBM 7090 or 7094 computer with 32K core storage, two IBM 7607 data channels, and eight IBM 729 tape units. The programs run under modified versions of the Fortran II Monitor System and in general are written in FAP.

These reports should be read in conjunction with a NASA report, NASA TM-X-57001, NASA Selective Dissemination of Information Program (IBM 7090/94 System), June 1966. The latter presents operating experience with the program after completion of the preliminary phases and transfer of the program to operation by the NASA Scientific and Technical Information Facility. It also describes program modification and discusses the availability of the IBM 7090/94 computer program.

Operation of the particular SDI program described in these three reports was discontinued by NASA in February 1966. Its termination was the result of continuing evaluation and evolution in all areas of the NASA SDI program. The 7090/94 program was replaced by an IBM 1410 system. The change recognized continuing advances in dissemination techniques and computer technology. A

bibliographic search program written for an IBM 1410 with 40K memory and process overlap and priority features was modified for SDI operation and was demonstrated to work effectively. An IBM Systems/360 Model 40 computer scheduled for installation by the NASA Scientific and Technical Information Facility during the summer of 1966 will include emulator hardware for 1410 operation during transition of SDI operations to the new computer system.

In addition to conversion of computer operation to a different computer, a change in the form of announcement was made early in 1966. Users of the NASA SDI service now receive a computer-printed listing of citations rather than abstract cards. The current NASA SDI program thus differs substantially from that described in this report and in NASA TM-X-57001 and NASA CR-62021. These reports are published as a record of a unique SDI system and a stage in the development of selective dissemination of information systems.

The IBM 7090/94 SDI program will be made available on request to organizations interested in studying this SDI system. The source program, documentation, and associated off-line IBM 1401 and 1410 programs described in report NASA TM-X-57001 can be supplied by special arrangement with NASA. Program maintenance would be the responsibility of the organization receiving it and no guarantee concerning its operation can be made.

Further information concerning the NASA SDI programs may be obtained from:

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

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

A. INTRODUCTION

1. Function of SDI

In an attempt to provide the individual scientists with a tool for managing the exploding volume of scientific and technical information, IBM undertook in 1959 to develop the concept of Selective Dissemination of Information. This concept affirms that the supplying of relevant information to persons desiring it, from the bulk of information available, can be accomplished effectively and economically by machine. Practically speaking, SDI may be said to be the reverse of a conventional library operation. A library stores documents and waits for users to come in the door. An SDI System stores representations of users' interests, and as documents come in the door, the system disseminates to users notices of documents that appear relevant to their interests.

The two basic inputs to an SDI system are user interest profiles and document content profiles, where a profile is a list of index terms generated by any type of indexing scheme. The basic computer function of an SDI system is comparing these two sets of profiles, to determine which document profiles sufficiently match which user profiles, the matching documents for any given user being those of which he should be notified. The basic output of an SDI system is document notifications, each consisting of an abstract with bibliographic information and a Port-A-Punch® card with which the user may report to the system his evaluation of the given document and also order a copy of the document if the system offers that service and he wants to have a copy. Document evaluation is valuable feedback to the SDI System for suggesting user profile modifications and determining system effectiveness. A minimal SDI System, such as described above, is illustrated in Figure 1.

2. History of NASA-SDI System

The effort of IBM and NASA to develop a Selective Dissemination of Information System for NASA scientific and technical personnel was undertaken in recognition of the need for experimentation with and adoption of new concepts to handle the information problem. The effort began in May 1963, with four months devoted to system planning and two to user profile preparation. Users were selected for the system on a representative basis from almost all NASA centers. User profiles were prepared via varying procedures, in an effort to discover what procedure would result in the most effective profiles. The system itself became operational in the second half of October 1963, utilizing computer programs IBM had developed and used internally for two years. Document input consisted of material appearing in NASA's Scientific and Technical Aerospace Reports (STAR). Document indexing and abstracting was furnished bimonthly to IBM by NASA's Scientific and Technical Information Facility.

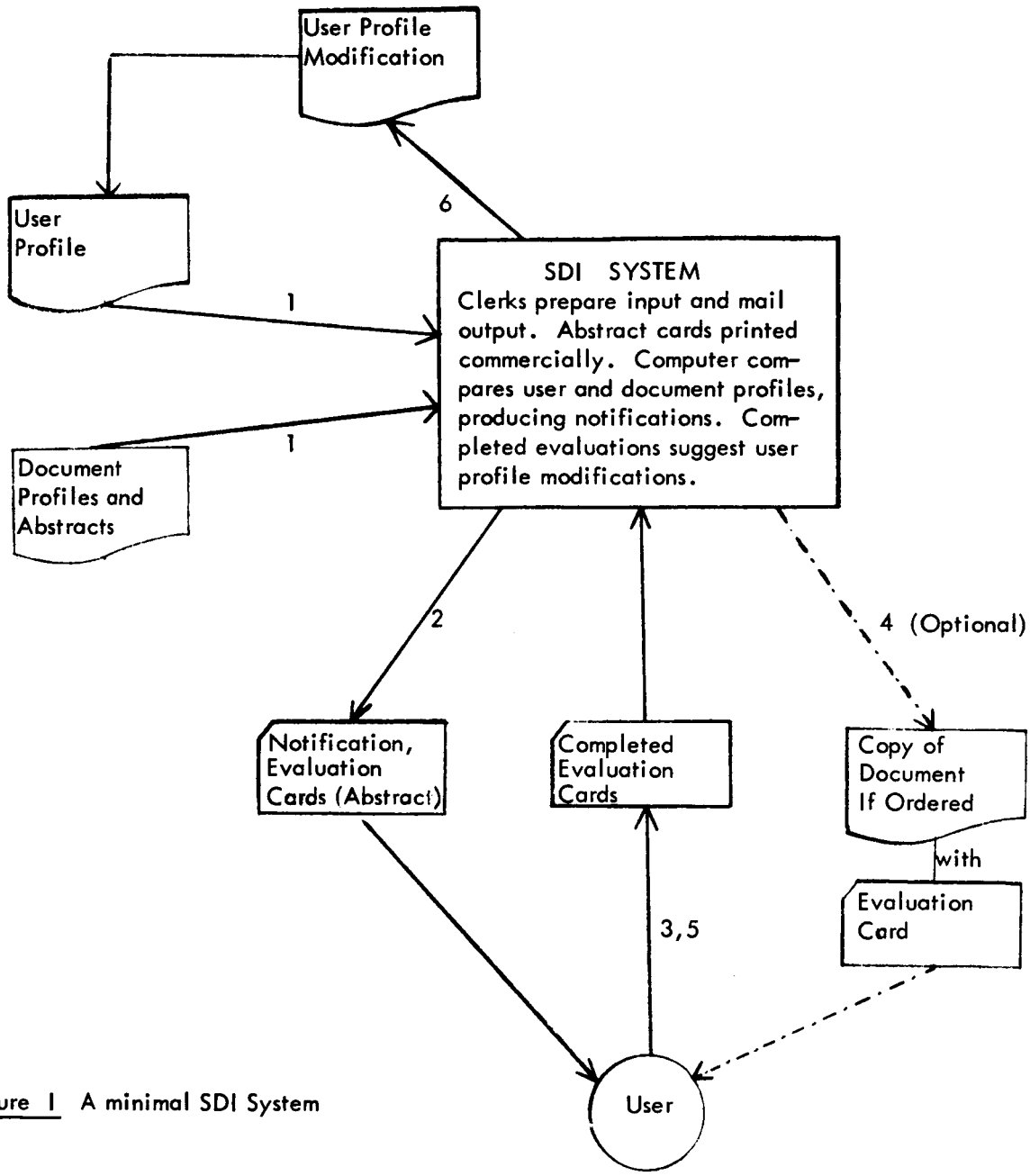


Figure 1 A minimal SDI System

Early in 1964, on the basis of system performance to that time, IBM and NASA agreed that certain new approaches should be introduced to the SDI System, in order to better serve the particular user and document populations. Thus, IBM undertook a major effort to design and program an SDI System specifically for NASA, while continuing system operation with the former programs. The newly programmed NASA-SDI System was phased into operation as it was completed during spring and early summer. Figure 2 illustrates the SDI System operated by IBM for NASA. Late in summer, questionnaires were prepared and submitted by IBM to all system participants, to obtain their evaluation of system performance. IBM and NASA then completed in parallel the last system run in August, following which the operation of the system was turned over to NASA's Scientific and Technical Information Facility, as of September 1964, for further implementation. The remainder of the contract period was spent in analyzing and evaluating system performance and preparing this final report.

Figure 3 documents the issues of STAR that were processed by the NASA-SDI System during the operational period at IBM. It also shows graphically for each issue the matching methods that were employed by SDI. IBM received the input for each STAR issue about two weeks ahead of the issue date, so that processing could be completed and notices sent just before that STAR issue was released. In Figure 3, therefore, while the STAR issues processed during the operational period are dated from November 1963, through the first half of September 1964, the operational period actually began and ended one-half month sooner. Figure 3 also illustrates how the operational period was divided into three phases. In Phase I, the operating programs were those developed by IBM for its own use. In Phases II and III, the programs were those developed by IBM especially for NASA, the matching portion only in Phase II and the entire program with vocabulary control in Phase III.

3. AFOAR Participation

During July and August 1964, 200 Air Force personnel participated in the NASA-SDI System, as a result of a request made by the Air Force Office of Aerospace Research to NASA. The Air Force thus obtained "live experience" in an SDI System for a two month period, and the NASA-SDI System acquired an expanded, more diverse user population.

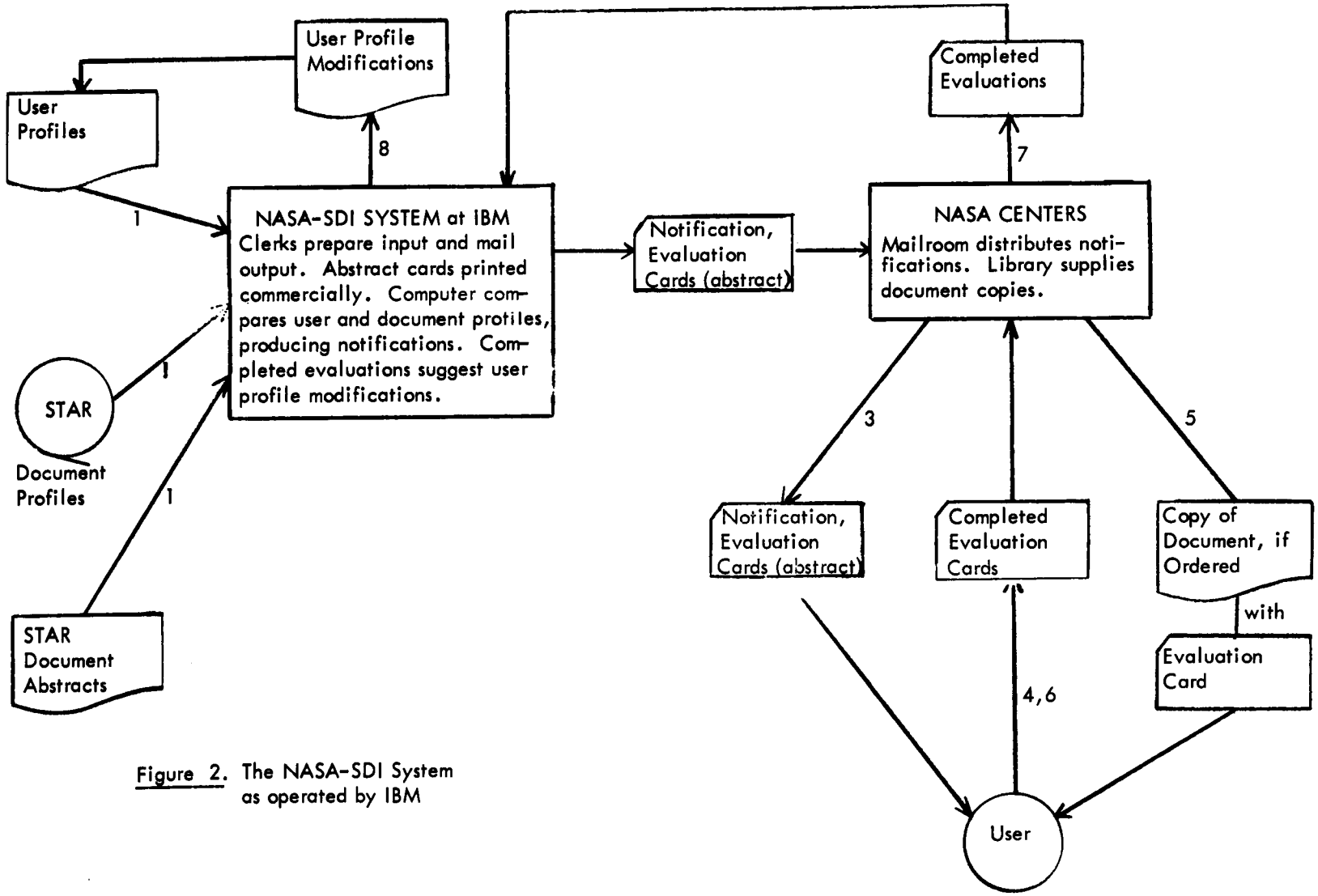
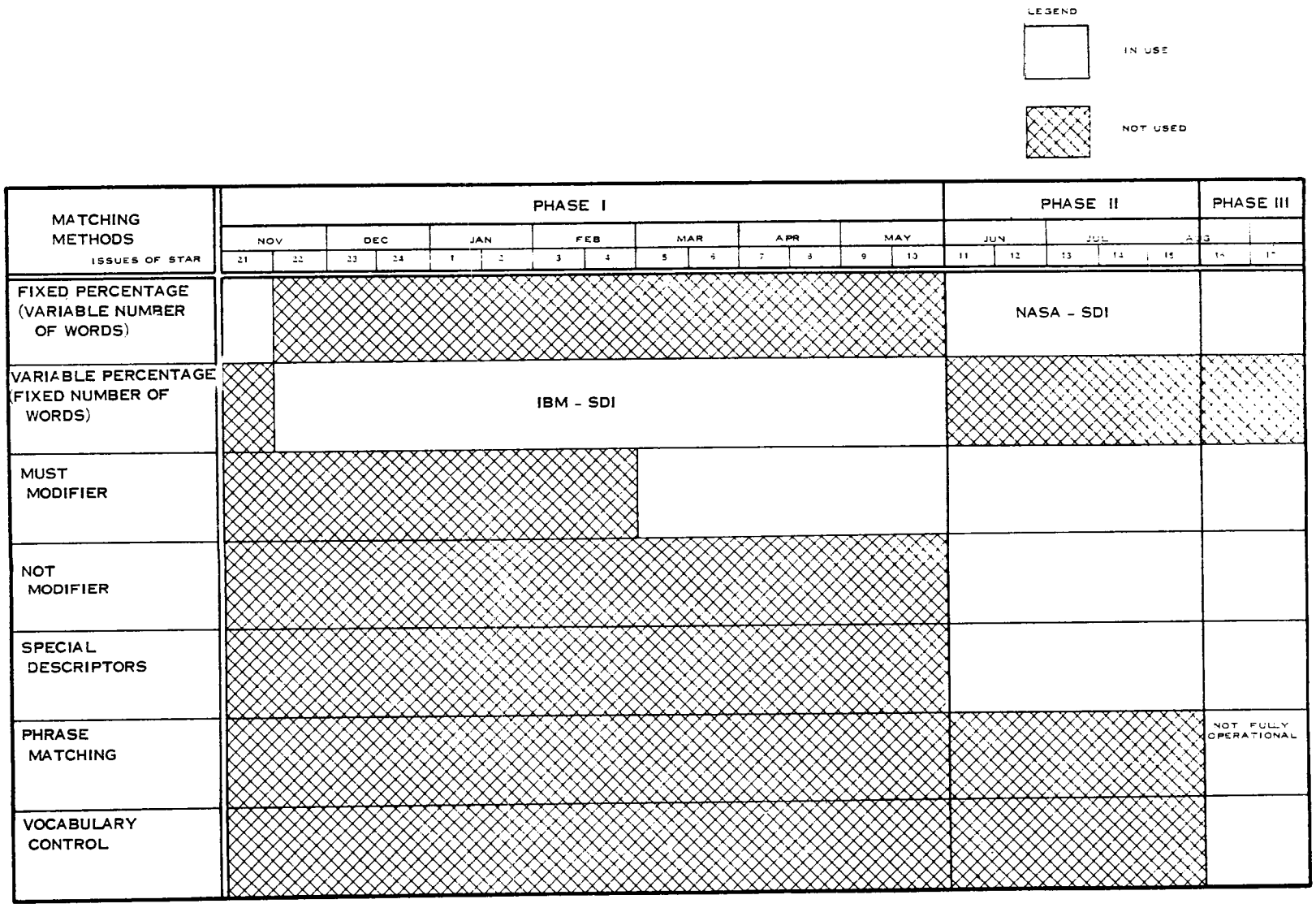


Figure 2. The NASA-SDI System as operated by IBM


LEGEND
IN USE
NOT USED
MATCHING METHODS
ISSUES OF STAR
PHASE I
PHASE II
PHASE III
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
21
22
23
24
1
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12
13
14
15
16
17
FIXED PERCENTAGE (VARIABLE NUMBER OF WORDS)
NASA - SDI
VARIABLE PERCENTAGE (FIXED NUMBER OF WORDS)
IBM - SDI
MUST MODIFIER
NOT MODIFIER
SPECIAL DESCRIPTORS
PHRASE MATCHING
NOT FULLY OPERATIONAL
VOCABULARY CONTROL

FIGURE 3

B. THE NASA-SDI SYSTEM

1. The Selection of Users

Since the SDI System to be developed for NASA was to be originally experimental in nature, an effort was made to select representative users from the ten NASA centers to be serviced. In each case, the users were selected by the individual participating center. The number of users per center was prorated on the basis of the number of scientific and technical personnel at that center in relation to the total number in the entire NASA complex. Nine centers designated primarily individual persons as users. One center designated only projects as users, so that, in this instance, one "user" profile may have represented as many as 200 persons. The Air Force users were selected by the nine participating AF locations in a manner comparable to that employed in selecting NASA users.

The total user population selected was heterogeneous, with respect to the field of aerospace research, as are the documents announced in STAR. However, some individuals expressed relatively narrow interests, in comparison to the content of the documents being processed, so that they received very little return for the effort they had expended in profile preparation. These individuals should perhaps not have participated in the SDI System, and a few such asked that their participation be terminated due to this condition.

2. NASA and AF Liaison Personnel

At each NASA and Air Force location participating in the SDI System, liaison personnel acted as intermediaries between the users at that location and the operating system at IBM. Much of the success of the system is directly attributable to the outstanding performance of these individuals. They assisted in user profile preparation and handled document requests. They also helped establish a rapport with the users, which would have been extremely difficult to accomplish without their assistance.

The NASA liaison personnel were briefed individually on the SDI System during visits to each center by an IBM SDI representative. These visits usually included a presentation by the IBM representative to prospective users, describing the system with emphasis on profile preparation. The AF liaison personnel were briefed on SDI at IBM in a joint meeting, and, when they returned to their locations, they presented the SDI System and the requirements for profile preparation to their users. Thus, many NASA users but few AF users had at least minimal direct contact with the system operators.

3. User Profile Preparation

In an effort to discover what profile preparation procedure would result in the most effective user profiles, three procedures were tried:

(1) Preparation of the profile by the user with no reference to a controlled vocabulary, following an oral-visual group presentation by an SDI representative. This consisted of system orientation and how to prepare profile, with sample profiles provided as handouts.

(2) Preparation with limited reference to a controlled vocabulary, following an individual oral-visual orientation and "how-to" conference, with sample profiles provided as handouts.

(3) Preparation, with unlimited reference to a controlled vocabulary, with the assistance of detailed, written orientation and "how-to" instructions, including sample profiles.

The utilization of all these procedures was not laid out systematically beforehand. Procedure (1), the planned procedure, was found to be inadequate in this particular application. As a result, the others were tried at various times during the operational period. Appendix 3 to this volume of the report contains the various forms that were used to educate and assist the user in profile preparation.

Of the three procedures, procedure (2) resulted in the most effective user profiles, in terms of user satisfaction and overall system performance. Procedure (2) is the most costly to implement, however. The cost can be significant in handling relatively large numbers of SDI users. Procedure (2) is also relatively difficult to administer with scientific and technical personnel. The SDI representative must repeatedly attempt to contact the potential user and arrange with him an appointment at least 45 minutes in length for the orientation and "how-to" conference, after which the user has still to prepare his profile.

Actually, the preparation of a profile by a user should occur over a period of time, since it involves a learning process. That is, after the user enters a profile in the system, he can revise it on the basis of the notifications he receives, deleting index terms that bring him irrelevant notifications and adding terms that he finds in relevant notifications.

A two-stage profile preparation procedure would appear to be the best. The first stage would consist of system orientation and initial profile preparation, using either procedure (1) or (3), the choice of procedure depending upon factors such as number of users in the system, location of users, funds available , etc. Procedure (1) of course requires in-person SDI representation, whereas procedure (3) can be implemented by mail. The second stage, which would occur up to several months after the user had entered the system, would consist of a variation of procedure (2). In conference with the user, or by mail, depending upon available funds and manpower, an SDI representative would review the user's responses to notifications and would offer him guidance in profile modification. A similar two-stage procedure utilized with some participants in the NASA-SDI System towards the end of the operational period appeared to yield relatively good results.

4. Document Profiles and Abstracts

All document abstracting and indexing was furnished to IBM by NASA's Scientific and Technical Information Facility, and covered those documents announced in STAR*. The full STAR abstract was used without change; if the length of a particular abstract exceeded the space available on the abstract notification card, as much as would fit was used. The source of the indexing was the combination of NASA's machine term vocabulary and published subject guide. NASA uses the former for retrieval purposes, while the latter appears as the index in STAR. With respect to index composition, the machine term vocabulary is dominated by uniterms, and the published subject guide is dominated by precoordinated uniterms.

The combination of these indices was expected to provide indexing depth, so that SDI could service users having general and/or specific interests. However, the indices overlapped a great deal. Overall, an average of thirteen unique index terms was obtained per document, including uniterms and precoordinated uniterms and excluding author names and contract numbers. Approximately 80% of the terms were found verbatim in the title and/or abstract of the document (or were derived from a term that did appear, i.e., a verb was changed to its noun form): 50% in the abstract and 30% in the title, with 23% of these appearing in both abstract and title. The remaining 20% of the terms must have been extracted from the text of the document or were introduced by the indexers. Early in the operating period, the indexing was roughly a half-and-half mixture of uniterms and precoordinated uniterms; by the end of the operating period uniterms largely predominated except for the terms obtained from the published subject guide.

For the first nine months of the operational period, the machine term and published subject indices were furnished separately in one format and two files. IBM combined them and converted them to a format suitable for use in the SDI System, eliminating overlapping. For the last month, one file representing both indicies was furnished in a different format. The NASA-SDI System is now programmed to accept only this new combined format, as it was used in the last two system runs at IBM.

* The system is able to handle all levels of classified material, in terms of excluding material from those not authorized to see it, but in this experimental system the inclusion of classified material was unnecessary and not planned for under the contract.

5. Comparison of User and Document Profiles

5.1 Introduction

The comparison of user and document profiles is the basic computer function in an SDI System. The object of the comparison is to determine the extent of match between a given profile pair, which in turn determines whether that user receives a notification of that document. The extent of match can be determined simply by the number of identical words found in a given user-document profile pair, three, four, five, etc., being sufficient to cause the sending of a notification, where both profiles are regarded as lists of single-word index terms. Or, a percentage (probabilistic) method can be employed in which the percentage of matched words calculated with respect to the document profile is compared to a set percentage, and a matching percentage equal to or greater than the set percentage causes notification. Thus, the number of words required to match could vary according to the number of index terms contained in each document.

These basic matching methods were utilized in the computer programs first used during the operational period at IBM. For NASA, however, these methods were found to be inadequate due to a lack of flexibility. As a result, IBM designed and wrote a set of SDI programs especially for NASA in which the matching methods are extended and modified to encompass the diversity of content and of scope within content that exists in the NASA user and document populations. This was accomplished through the addition to the system of vocabulary control, and through the addition of options to the user profile, including index-term modifiers, multi-word index terms and exclusion capability.

Vocabulary control provides the NASA-SDI System with power to ensure that user and document employ the same words to describe the same things. A tacit assumption inherent in the SDI approach to the information problem has always been that the vocabularies employed by user and document will be substantially identical. This is generally true, but not always specifically true. In the NASA mission, specificity can be highly important. Thus, the NASA-SDI System was designed to employ a controlled vocabulary. The index terms found in document profiles form the base of this vocabulary, and new document terms augment it. User terms are edited against the vocabulary before matching of profiles begins. In this way, a common vocabulary is achieved. The vocabulary and the user profiles are, of course, always accessible to additions and deletions, as formulated by the system operators. An important adjunct of the vocabulary is the equate relationship, which allows the operator to designate vocabulary terms as synonyms.

The options that are added to the user profile in the NASA-SDI System - index-term modifiers, multi-word or phrase index terms, and exclusion capability - give the user power to tailor the system to fit his own particular information needs. As previously implemented, SDI had constituted a proven method for distributing to users information that was quite likely to be relevant to their interests. But a user could not, for example, demand all information on a given contract. He could set up his profile so that he probably would get all the information, but he could never be sure that he would. The must modifier option in the NASA-SDI System gives the user that surety. If he modified an index term in his profile with a must, he will receive notices of all documents indexed with that term. With respect to matching methods, a match on a must term is a one-word match that causes notification. Similarly, the option of multi-word index terms or phrases lowers the number of matching words required to cause notification. For example, two matched words of a two-word phrase will cause notification. This optional lowering of match criteria would be less practical and might perhaps even be detrimental to the effectiveness of the system if vocabulary control were not also employed. The standard percentage-type match, during the test, was the backbone of the system. The percentage required may be varied in each system run and is a function of the shorter of the two profiles participating in a given comparison. The other side of the coin from the must and phrase options and the percentage match in the NASA-SDI System is represented by the not index term modifier. A match on a not modified index term excludes from notification, and a not match overrides any other match. A not modifier may be applied to any index term, single word or phrase, and is subject to the same matching specifications.

The implementation of vocabulary control and user profile options in the NASA-SDI System is described in detail below, Section 5.2 - 5.6. The paragraphs above constitute only an enumeration and sketchy summary of the subject. The full description that follows is complex, but anyone who may engage in operating or administering the NASA-SDI System should understand the implementation fully in order to work with the system most effectively. Therefore, the description below is as complete and as specific as possible within the confines of this report.

5.2 Structure of Vocabulary Control Guide

Figure 4 illustrates a few hypothetical entries in the vocabulary control guide. The purpose of the guide is to enable the system to ensure that the user and document employ the same words to describe the same things. The guide consists primarily of single-word index terms, or descriptors: a large number of primary descriptors currently admissable in the system, a small number of disallowed secondary descriptors of low information content called "trouble terms", and a small number of secondary descriptors that are synonyms of the primary

descriptors and are equated to them. The guide also includes a small number of proper name descriptors. In Figure 4, Item 6, WING, illustrates a primary descriptor. Item 3 shows the primary descriptor FUEL with its secondary descriptor PROPELLANT. The descriptor SYSTEM, Item 5, is classed as a trouble term. Item 7 illustrates a proper name descriptor STRATEGIC AIR COMMAND, which is concatenated to STRATEGICAIRCOMMAND and entered into the vocabulary in order to allow the synonym relationship, SAC = STRATEGICAIRCOMMAND, to be established. The vocabulary is limited to single-word descriptors (or in the case of proper names to concantenated phrases), to keep the number of entries within manageable bounds, thus minimizing the amount of computer time required.

Document descriptors form the base of the vocabulary control guide, since the documents are indexed professionally. Each time a new group of documents enters the system, all single-word descriptors and the component words of all multi-word descriptors (phrases) that do not already occur in the vocabulary guide are added to it. The system operator may designate trouble terms, add, delete, or equate vocabulary descriptors at his discretion. He should review, for example, the record of vocabulary activity produced by each system run, to determine which other descriptors should be added or which deleted, and which should be equated.

	Primary Term	Secondary Term
(1)	Satellite	Satellites
(2)	Electric	Electrical
(3)	Fuel	Propellant
(4)	Mathematical	Mathamatecal
(5)	(Zero)	System
(6)	Wing	(none)
(7)	Strategic Air Command	SAC

Figure 4 Typical Entries in the Vocabulary Control Guide

In Figure 4, Items 1-4 illustrate the uses of the synonym relationship or equate function, to equate plural to singular, affixed form to root form, synonym to primary descriptor and common misspelling to correct spelling; the trouble term, Item 5, is the null case of the equate relationship. These examples give some idea of the power and the scope of the equate function. Because of this power and because of the way in which the function is instituted in the system, extreme care must be used in naming synonyms and trouble terms. When a

synonym or trouble term relationship is first established, the vocabulary and user profiles will be updated to reflect the relationship. But this process is so structured that for all existing profiles no way exists to "un-update" that relationship later and substitute another by means of vocabulary guide. That is, the relationship would have to be changed individually for each profile in which it occurs.

To explain: In the vocabulary control guide, each English descriptor entry has two binary descriptor codes associated with it, primary and secondary. All descriptors are expressed as binary codes created uniquely by the program. Because each code occupies only a single machine word, the codes may be compared far more quickly and conveniently than the English descriptors, most of which would occupy two or more computer words.* For a primary descriptor, both codes are the same and both are the codes of the primary descriptor. For a secondary descriptor, the code of the synonym or secondary descriptor appears as the secondary code and the code of the primary descriptor to which it is equated appears as the primary code. For trouble terms, the code of the trouble term appears as the secondary code and the primary code is zero. When profiles are edited against the vocabulary, whatever codes appear as the primary codes in the corresponding vocabulary entries replace the English descriptors in the profiles. Codes for secondary descriptors and trouble terms thus do not exist in the edited profiles; only codes for primary terms appear. The secondary code could, of course, be carried in the profile, but was eliminated in order to keep profile size to a minimum and thus decrease machine time for matching. However, its absence limits the equate function in at least two specific cases.

In the first case, synonym relationships are limited to one level. For example, if PONY were equated to HORSE, and the operator wished to enter the synonym SHETLAND into the system, he must enter it as a synonym of HORSE and not of PONY, because PONY is already a secondary descriptor. Only the code for HORSE appears in the profiles, so if SHETLAND were equated to PONY, the code for PONY could never be found and the equate would have no effect on existing profiles. HORSE could be equated to say, ANIMAL, however, without any difficulty because HORSE appears everywhere in the profiles where it originally appeared and also everywhere where PONY appeared. So, if HORSE became a synonym of ANIMAL, ANIMAL would replace all HORSE entries in the profiles (including the former PONY entries), and HORSE would become a secondary descriptor.

*A complete description of this coding is presented in Volume II, Section B, Subroutine CODER.

In the second case, an established synonym relationship cannot be broken in existing profiles. For instance, if MULE were equated to HORSE, MULE could not later be equated to DONKEY or established as a primary descriptor, the reason again being that the code for MULE could never be found in existing profiles.

In either case above of course, the vocabulary control guide can be changed to reflect the described relationship, and that relationship will be applied in new profiles and all subsequent profile changes. All existing profiles containing the now outdated relationship would then have to be modified one by one as conditions warranted. If the outdated relationship were causing erroneous notifications in quantity, establishing the new relationship would probably be desirable. Only long-term operating experience will show whether the savings in computer time are worth the consequences of limiting the equate function.

5.3 Structure of Document Profile

Figure 5 illustrates a typical STAR document profile. It consists of the index terms assigned to it that delineate its content. These are called ordinary descriptors. It also includes contract number, STAR subject category, and author name as applicable. These are called special descriptors. Ordinary descriptors are regarded for comparison purposes as single-word descriptors, with duplicates being ignored. OGEE is a single word descriptor, as is FREE-FLIGHT because it is hypenated. TURBULENT HEAT TRANSFER is divided into TURBULENT and HEAT and TRANSFER; TRANSONIC SPEED is divided into TRANSONIC and SPEED, but both are ignored since they are duplicated by the descriptors, SPEED and TRANSONIC, found as single words in the sample document profile. Special descriptors are concatenated for comparison purposes to single-word character strings; J. B. W. EDWARDS, an author, becomes JBWEDWARDS. At the time of comparison, all descriptors are expressed as binary codes as described previously.

DOCUMENT N64-24924

17-03

FREE-FLIGHT	MEASUREMENTS
J.B.W. EDWARDS (author)	ARC-CP-670
ZERO-LIFT	OGEE
RAE-AERO-2851	ARC-24448
DRAG	LIFT
MEASUREMENT	SLENDER
SPEED	SUPERSONIC
SUPERSONIC SPEED	TRANSONIC
TRANSONIC SPEED	TURBULENT HEAT TRANSFER
WING	

Figure 5. A Typical NASA Document Profile

USER-001900 S B ANDERSON AME
FSSR FS SYS

C	AF 33/616/8431 (contract number)	M	AILERON
	AIRFOIL SECTION		ALL WEATHER LANDING
	BACK SIDE DRAG CURVE		CONTROL GLIDE PATH
	DRAG		DRAG COEFFICIENT
	FAN		FLAP
	FLIGHT SIMULATOR		GROUND EFFECT
	HANDLING QUALITY LANDING APPROACH		
	HEADS UP DISPLAY		
	LATERAL DIRECTIONAL HANDLING QUALITY		
	LONGITUDINAL LANDING QUALITY		MINIMUM DRAG
D	NASR 65/ 00	N	PROPELLER FAN
	REACTION CONTROL NOZZLE	N	SATELLITE
	SLAT		SLAT LEADING EDGE
M	SPOILER	M	STOL
M	TAKEOFF	M	V/STOL
	VERTICAL LIFT	M	WING
M	X-19	M	XC-142
M	XV4A		ZERO-ZERO LANDING

Figure 6. A Typical NASA User Profile

5.4 Structure of User Profile

May Descriptors

Figure 6 illustrates a typical user profile in the NASA-SDI System. It consists of descriptors that delineate the user's interests, including NASA subject classification if desired. In the user profile, ordinary descriptors (in the same sense as the document profile) are regarded for comparison purposes as either single-word or multi-word (phrase) descriptors, in whatever form the user may have entered them. The user is thus not limited to those particular multi-word descriptors that appear as document index terms. This approach was adopted to allow the user to avoid the ambiguity of single words by stating his interests as phrases, as well as to minimize the occurrence of "cross-talk" (illogical combinations of words). In this profile, DRAG is an ordinary single-word descriptor as is ZERO-ZERO LANDING; SLAT LEADING EDGE is an ordinary multi-word descriptor. The component words of multi-word descriptors are added to the user profile as single-word descriptors if they do not already so appear, in addition to appearing as phrases. This is done to increase matching possibilities when none of the other options (see below) yields a notification. For example, VERTICAL LIFT appears as a multi-word descriptor and would also appear as the two single-word descriptors, VERTICAL and LIFT. Again, all descriptors are expressed as binary codes. A separate file of user profiles, called historical profiles, records the descriptors in English for printout purposes.

Ordinary single-word descriptors in the user profile participate in the percentage type match previously described, with the percentage calculation based upon the profile having the least number of single words of the two profiles being compared:

$$\frac{\text{number of matching words}}{\text{number of single words in shorter profile word list}} \quad (100) = X\ \%$$

This percentage must not be less than a predetermined figure, if notification is to occur.

Phrases

Ordinary multi-word descriptors allow the user to change these matching criteria, depending upon the number of words in the descriptor. For instance, if three words of the four-word descriptor BACK SIDE DRAG CURVE were matched, a notification could be sent, whereas three single words alone may otherwise be insufficient. For notification, the phrase matching criteria are two words of a two-word phrase, 3 of 3, 3 of 4, 3 of 5, 4 of 6, and 5 of 7. Single-word and components of multi-word descriptors are called may descriptors, in that if enough of them match, either as single words or within phrases, they may cause notification.

Must and Not Descriptors

Two complementary descriptor modifiers are available to users, must and not (M and N). They may be applied to either single or multi-word descriptors. Exclusion capability resides in the presence of the not modifier. In the sample profile, N SATELLITE is an ordinary not modified descriptor. By this, the user has requested that he never receive a notification of a document having the descriptor SATELLITE. The must modifier, on the other hand, guarantees that the user will receive a notification of a document having that given descriptor if no not descriptor matches also. This user has indicated that he wishes to receive notifications of all documents indexed by STOL - unless they are also indexed by SATELLITE (which is not likely), since the not takes precedence over the must.

The special descriptors (in the same sense as the document profile) are always modified by either a must or not. In fact, they are identified by their modifiers as being special descriptors; P and Q for must and not authors; C and D for must and not contract numbers; S for not subject category (must not available). Special descriptors are concatenated as described previously and are treated as modified single-word descriptors. In Figure 6, C AF 33/616/8431, a contract number, is a must special descriptor.

5.5 Profile Editing

All new user profiles and profile changes are edited against the vocabulary control guide before comparison begins. Any ordinary single-word descriptors either not occurring in the guide or occurring as trouble terms are delineated from the user profile. Multi-word descriptors are deleted unless at least 2 of 2, 3 of 3, or 3 of 4, 4 of 5, 5 of 6, 5 of 7 words of the descriptor appear in the guide. Any synonyms are replaced by their respective primary terms. New document profiles are passed against the guide to update it, as previously described, and also to be edited for synonyms and trouble terms. At the time of comparison, then, nothing appears in any profile that does not appear in the guide (with the exception of special descriptors), or, in other words, user and document profiles have been edited against the guide so that they share a common vocabulary.

The results of all editing, of course, are under the control of the system operator. He would not ordinarily countermand immediately the editing that takes place in a given run before matching for that run has been completed, but at any point thereafter he is free to override the additions and deletions that have been made in the vocabulary and the profiles.

5.6 Profile Comparison

When a user profile is compared with a document profile:

(1) A sufficient match on one not descriptor, multi- or single-word, prevents a notification

(2) A sufficient match on one must descriptor; on one unmodified multi-word descriptor; or on a set percentage of unmodified single-word descriptors causes a notification.

Sufficient match is defined as any of:

(1) One matching modified single-word descriptor, must or not or special descriptor

(2) One matching multi-word descriptor: two words of a two-word descriptor, 3 of 3, 3 of 4, 3 of 5, 4 of 6 and 5 of 7, variable by program change.

(3) A set percentage of matching unmodified single-word descriptors variable by control card for each system run, the percentage calculation based upon the formula previously presented (page 16).

The comparison is carried out in straightforward fashion. The matching routine gets the first document descriptor and does a serial and/or binary search of the user profile for that descriptor. When no match is found, the routine gets the second document descriptor, and so forth, to the end of the document profile. When a match is found, if it is on a not special descriptor or a not single-word descriptor, comparison terminates and the routine proceeds to examine the next profile pair, so that any notification that might have been sent is prevented. If the match is on a must single-word descriptor and no not descriptors exist in the user profile, the profile comparison is terminated and notification occurs. If the match is on an ordinary single-word descriptor existing either by itself or as a component of a multi-word descriptor a count is kept of it. The routine then gets the next document descriptor and repeats. When the end of the document profile is reached, the must record is checked and a notice sent if one or more must descriptors matched and a check of the phrases shows that no not phrases matched; if a not phrase matched, notification is prevented. If no must descriptors matched, the single-word count percentage is computed. If it is great enough and a check of the phrases shows that no not phrases matched, notification occurs. If the single-word percentage is too small, all phrases are checked: a matching not phrase prevents notification; a matching unmodified phrase causes notification.

The user profile in Figure 6 matches the document profile in Figure 5 on the three descriptors, M WING, LIFT, and DRAG. Because no not phrases or single terms match, the notification occurs as a result of the must match on M WING. That LIFT and DRAG also match is a good indication that the user would find the notice relevant, which he did, but by themselves in this case LIFT and DRAG would not have been sufficient to cause notification.

6. Notification to Users

A NASA-SDI document notice is pictured in Figure 7. The notice consists of the notification-evaluation card and the corresponding document abstract card. The user receives each notification inserted in the identifying window envelope.

The notification-evaluation card is a preprinted Port-A-Punch ® card into which is punched by computer a notification record, document number, user name, address, etc., as prepared by the program that compared the user and document profiles. The notification records are sorted by computer into document number order before punching, so that all the records for a given document number appear together. The document number consists of the last five digits of the accession number assigned to the document by NASA. The notification-evaluation card has a dual purpose. As a notification card, it addresses a given notice to a given user. As an evaluation card, it enables the user to inform the system of the relevancy of the notice.

The abstract card contains the STAR abstract and bibliographic information as supplied to IBM by NASA's Scientific and Technical Information Facility. IBM received xerox copies of the abstract galley proofs and separated these into individual abstracts. The abstracts were then reproduced by commercial photo-offset and printed on the cards, with photographic reduction and/or shortening of the abstract from the bottom up as necessary to fit the available space on the card. The number of copies required of each abstract was calculated by computer from the sort notification records and provided to the printer.

To facilitate retention and filing of abstracts by users, they are printed on a 3 x 5 perforated section of the card.

The punched and interpreted, sorted notification cards were collated with the corresponding abstract cards and inserted in the window envelopes by an envelope inserter machine at IBM. Then, the notices were sorted manually on NASA-SDI location only and mailed to a central address at each location. The various locations distributed the notices to the individual users through their internal mail systems.

7. User Rating of Document Notices

Upon receiving a NASA-SDI document notification, the user reads the document abstract and then completes the notification-evaluation card by pushing out with a pencil point, or any sharp instrument the appropriate Port-A-Punch® chip (Figure 7). If the document notice is relevant to his interests and he wants a copy of the document, he punches "Of interest, document requested". If the notice is relevant but the abstract is sufficient for his purposes, he punches "Of interest, document not requested". If he already knows of the document from some other source, he punches "Of interest, have seen before". Or if the notice is irrelevant, he punches "Of no interest". He may also, by pushing out the "comments" chip on the card, indicate that he has written comments in the comment box, such as address changes, profile modifications, suggestions, or criticisms. The user then returns the notification-evaluation card, now called the first response card, to the library at his location, so that they may supply a copy, if he requested a copy, and return the response card to IBM.

8. Handling of Document Requests

At all locations, the NASA Center library supplied the NASA-SDI users with copies of documents that were ordered via the first response cards. Document copies generally were available either in full-size reproductions or in microfiche form. For the first eight and one-half months of the operational period, only unclassified documents having microfiche available were announced; for the last one and one-half months, all unclassified documents were announced. Throughout the operational period, however, the location libraries supplied either full-size or microfiche copies in local-option fashion. Some libraries supplied only full-size copies. Others supplied only microfiche copies. Still others supplied either full-size or microfiche copies, depending upon the individual user's preference. Many users utilized the microfiche copy for determining their need for a full-size copy, rather than requesting the full-size copy and finding out only when it was received that it was not of value after all. This practice appeared to be the most predominant one.

9. User Rating of Documents

With each NASA-SDI document forwarded by the library to the requesting user, a preprinted document-evaluation card was supplied. The document and card were mailed together in a special window envelope (Figure 8). By punching out the appropriate Port-A-Punch® chip in the evaluation card, the user rated the actual document as "relevant to my

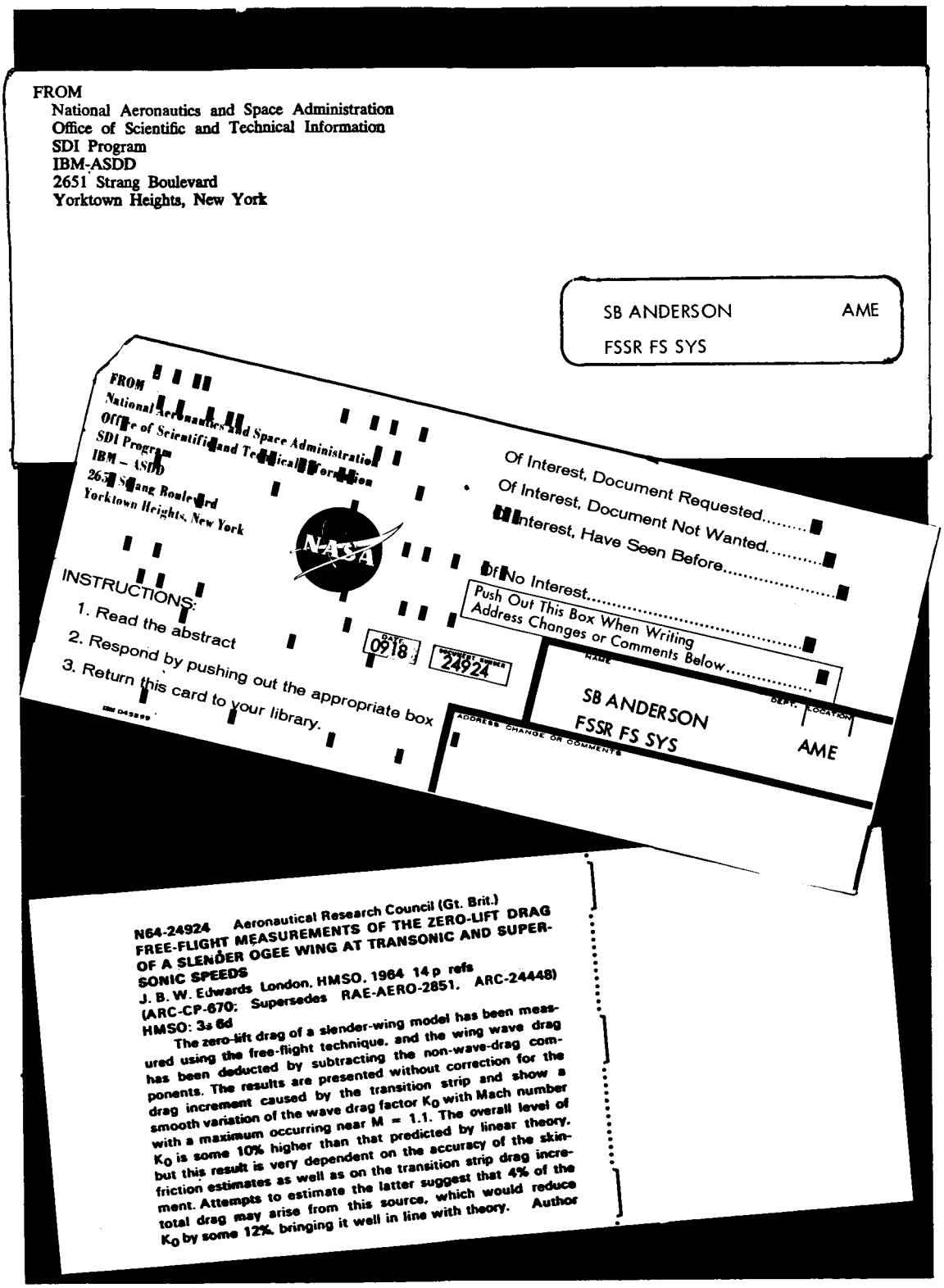

FROM
National Aeronautics and Space Administration
Office of Scientific and Technical Information
SDI Program
IBM-ASDD
2651 Strang Boulevard
Yorktown Heights, New York
SB ANDERSON AME
FSSR FS SYS
Of Interest, Document Requested.....
Of Interest, Document Not Wanted.....
Interest, Have Seen Before.....
No Interest.....
Push Out This Box When Writing Address Changes or Comments Below.....
INSTRUCTIONS:
1. Read the abstract
2. Respond by pushing out the appropriate box
3. Return this card to your library.
DATE 0918
ACCESSION NUMBER 24924
NAME
SB ANDERSON
FSSR FS SYS
DEPT. LOCATION
AME
ADDRESS CHANGE OR COMMENTS
N64-24924 Aeronautical Research Council (Gt. Brit.)
FREE-FLIGHT MEASUREMENTS OF THE ZERO-LIFT DRAG OF A SLENDER OGEE WING AT TRANSONIC AND SUPERSONIC SPEEDS
J. B. W. Edwards London, HMSO, 1964 14 p refs
(ARC-CP-670; Supersedes RAE-AERO-2851. ARC-24448)
HMSO: 3s 6d
The zero-lift drag of a slender-wing model has been measured using the free-flight technique, and the wing wave drag has been deducted by subtracting the non-wave-drag components. The results are presented without correction for the drag increment caused by the transition strip and show a smooth variation of the wave drag factor K_0 with Mach number with a maximum occurring near M = 1.1. The overall level of K_0 is some 10% higher than that predicted by linear theory, but this result is very dependent on the accuracy of the skin-friction estimates as well as on the transition strip drag increment. Attempts to estimate the latter suggest that 4% of the total drag may arise from this source, which would reduce K_0 by some 12%, bringing it well in line with theory. Author

FIGURE 7

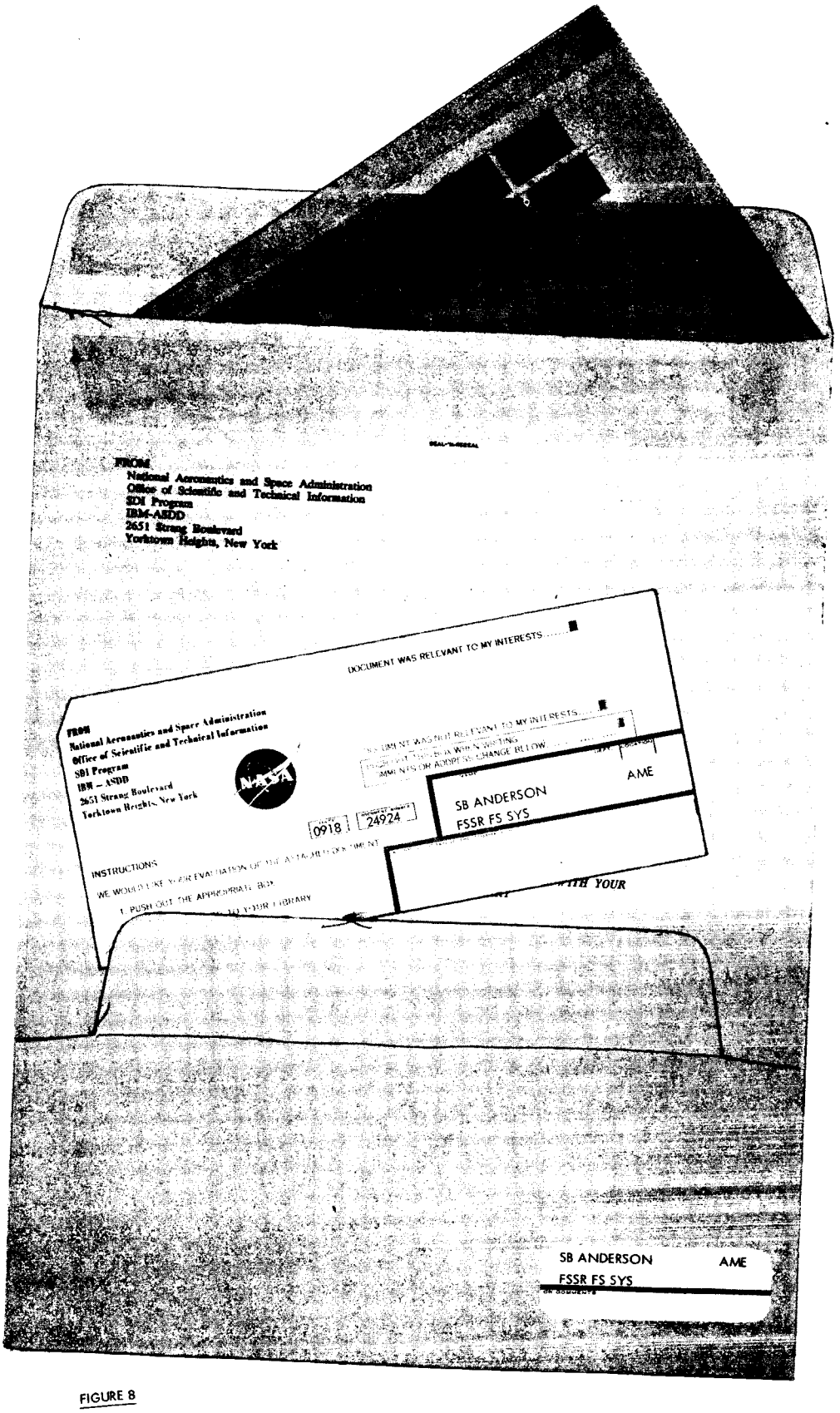

FROM
National Aeronautics and Space Administration
Office of Scientific and Technical Information
SDI Program
IBM-ASDD
2651 Strang Boulevard
Yorktown Heights, New York
DOCUMENT WAS RELEVANT TO MY INTERESTS
FROM
National Aeronautics and Space Administration
Office of Scientific and Technical Information
SDI Program
IBM – ASDD
2651 Strang Boulevard
Yorktown Heights, New York
0918
24924
SB ANDERSON
FSSR FS SYS
AME
INSTRUCTIONS
SB ANDERSON
FSSR FS SYS
AME

FIGURE 8

interests" or "not relevant to my interests". He returned the evaluation card, now called a second response card, to the library. If he returned it in the envelope in which he had received it, the envelope could be re-used. The document-evaluation cards were punched with name and address and interpreted in quantity for each user ahead of time. When a user requested a document, the library clerk selected one of his response cards, filled in the date and the document number on the card, and sent the document with the card to the user.

The purpose of the second response was to determine the adequacy of the titles and abstracts in describing the content of the documents. That is, if the user ordered an apparently promising document and found upon receiving it that it wasn't what he had been led by the title and abstract to believe it would be, he could easily indicate this discrepancy to the system via the card. The analysis of returned second response cards by IBM shows that in 90% of the cases the users found that the titles and abstracts supplied by NASA for the STAR documents were adequate for determining the relevancy of the documents.

10. Processing of User Responses

From each NASA-SDI location, the first and second user responses were forwarded to IBM by the library. The first responses were complete as received; the second responses were completed by keypunching into each card the hand-written document number and date. The first responses were then associated with the corresponding notifications, by computer programs, to provide a statistical record of each notification and its relevance to the user's interests. These accumulating statistical records can be analyzed, again via computer, to determine, for example how any individual user is benefiting (or not benefiting) from the system, or how all users at a given location are benefiting, etc. The second responses could have been included in the statistical records, but as a matter of convenience they were analyzed separately, as previously described. The computer program that associates responses with notification records can also produce document-evaluation or second response cards as required by document requests in first responses. But the decentralized manner in which the NASA-SDI System was operated precluded the utilization of this capability. In fact, had it been utilized, significant handling delays in providing document copies would have been incurred. As part of the computer processing of the responses, those cards that contain comments are separated for the handling of the comments. Address changes and profile changes are routed to clerks who prepare them for entry into the system. Complaints and suggestions are handled by the system operator, who contacts users as necessary in each situation.

11. Modification of User Profiles

Two formal methods of profile modification were employed in the NASA-SDI System during the operational period at IBM: profile printout mailings and random notices. The users were, of course, also encouraged to submit profile changes by memo or in the comments box of any response card.

Profile printout mailings, prepared by computer, were made at approximately three-month intervals. Each time, the user was sent two copies of his profile and was asked to correct and return one copy to the system. He was advised to make modifications suggested by his experience with the system, as well as modifications required by changes in his interests. This procedure resulted in more modifications than any other.

Random notices were issued to users in most system runs, a random notice being any notice that a given user would not receive through profile comparison. Random notices serve both as a means of evaluating the system and as an aid in profile modification. When a user finds a random notice relevant, he has indicated that the system missed sending him this notice on the basis of his profile. Such "miss" could indicate either user shortcoming in profile construction and modification or system shortcoming in comparison methods or document indexing. Users were told that they would receive random notices, but the random notices that they did receive were not easily identified as such.

The criteria governing random notice generation varied over the operational period. During Phase 2 and 3 (Figure 3) throughout which at least the comparison portion of the NASA-SDI system was operating, restricted random notices were produced. That is, notices that the user would receive through profile comparison were prevented from occurring on a random basis, as were notices that he would exclude through profile comparison. The maximum number of random notices that a given user is eligible to receive per system run is a control card parameter; the number he actually receives varies also at random, though it cannot exceed the maximum. Some difficulties were experienced during the start-up of Phase 2, such that random notices were first generated incorrectly and then were omitted entirely until the difficulties were cleared up. During Phase 1, each user received two random notices per every 1000 documents processed. These notices, however, were not truly random according to definition. The random generation occurred just prior to profile matching for a given user-document pair, at which point it was not known whether comparison would have yielded the notice.

With respect to comparison methods, an analysis of a random sample of 100 random notices regarded as relevant by NASA-SDI users, showed that in 45% of the cases no descriptors were common to the user and document profiles; in the remaining 55%, at least one descriptor was common. In 58% of the no cases, at least tangential relationship was found to exist between the interests of the user (predicated from his profile) and the content of the document, while in 42% no relation was evident. Refinements in matching methods, in document indexing and in user profile preparation should reduce this problem. In addition, more extensive use of the synonym capability of the vocabulary control guide should be of real value. Unfortunately, the time restraints of the contract prohibited exploration and evaluation of these problems.

A third and more informal method of profile modification was also employed at intervals during the operational period. When a user was observed to be rejecting a proportionally large number of notices, the system operator reviewed his profile and made appropriate modifications. This procedure also gave significant clues as to how matching methods could be improved. For example, it early revealed that any user having few words in his profile was getting very few notices. As a result, the must modifier was adopted, and later, the percentage calculation procedure was adjusted to take profile length into consideration.

In conclusion, overall experience indicates that the best way to persuade the user to modify his profile is to have the system periodically nudge him by sending him his profile with possibly appropriate suggestions or with a simple request to review it. The area of profile modification is perhaps the most critical of the entire NASA-SDI System. Further investigation, as well as evaluation, will be required in order to discover optimum procedures from the dual standpoint of the system and the user.

12. Equipment and Personnel Utilized

Implementation of the NASA-SDI system, servicing up to 1000 users, with document abstracting and indexing furnished to the system, with printing supplied on a contract basis, and with libraries handling document copies, required the following equipment and personnel:

Equipment

(1) IBM 7090/94 Data Processing System, with at least eight tape drives.

(2) IBM 1401 Data Processing System, with at least two tape drives and 8K core storage.

(3) IBM 557 Alphameric Interpreter.

(4) IBM 026 Keypunch.

(5) Envelope inserter, with at least two inserting stations.

(6) Typewriter.

(7) Card files..

Personnel

(1) Information Specialist

The function of the Information Specialist is to analyze user responses and to edit user profiles, as well as to be cognizant of changes which should be made in the system in response to the users being serviced. In addition, he handles operation of all computer programs.

(2) Clerk-Typists (2)

One clerk's responsibilities are to log all abstract copies to and from the printing facility and to handle all incoming and outgoing notifications. The other clerk's responsibilities are to maintain all user profiles and to handle typical user correspondence.

(3) Supervisor

The function of the Supervisor is to handle administrative matters, scheduling, and certain classes of user correspondence.

C. SYSTEM PERFORMANCE AND EVALUATION

1. Analysis of Notifications and Responses

1.1 Introduction

The following is an analysis of notifications and responses issued and returned during Phases I and II of the operational period of the NASA-SDI System at IBM. In Phase 1, November 1963 to May 1964, IBM utilized an existing matching program that had been developed previously. During Phase II, June to August 1964, portions of the new NASA-SDI programs were introduced as they were completed. The phasing of the operational period is illustrated in Figure 3. A final phase, Phase III, also shown in Figure 3, is not analyzed bacause at that time IBM was turning the operation of the system over to NASA. An historical overview is provided in Figures 9, 10, and 11 of the number of documents processed, the number of notifications mailed, and the number of documents requested, respectively.

Throughout the operational period, two types of notices were distributed, non-random and random. Non-random or standard notices were issued as a result of matches between subscribers' interest profiles and document content profiles. Random notices were sent in small quantities to check on the success of the System in notifying subscribers of documents in which they were interested, and to assist them in improving their profiles by uncovering previously unused descriptors.

Four responses were possible to any notice, non-random or random. These were:

(1) Of interest, document requested

(2) Of interest, document not wanted

(3) Of interest, have seen before

(4) Of no interest

The subscriber could also, of course, not respond at all. Those non-random notifications which had been initially regarded as "no-responses" but which were eventually returned showed the following percentages of responses:

(1)	Of interest, document requested	33%
(2)	Of interest, document not wanted	29%
(3)	Of interest, have seen before	4%
(4)	Of no interest	34%

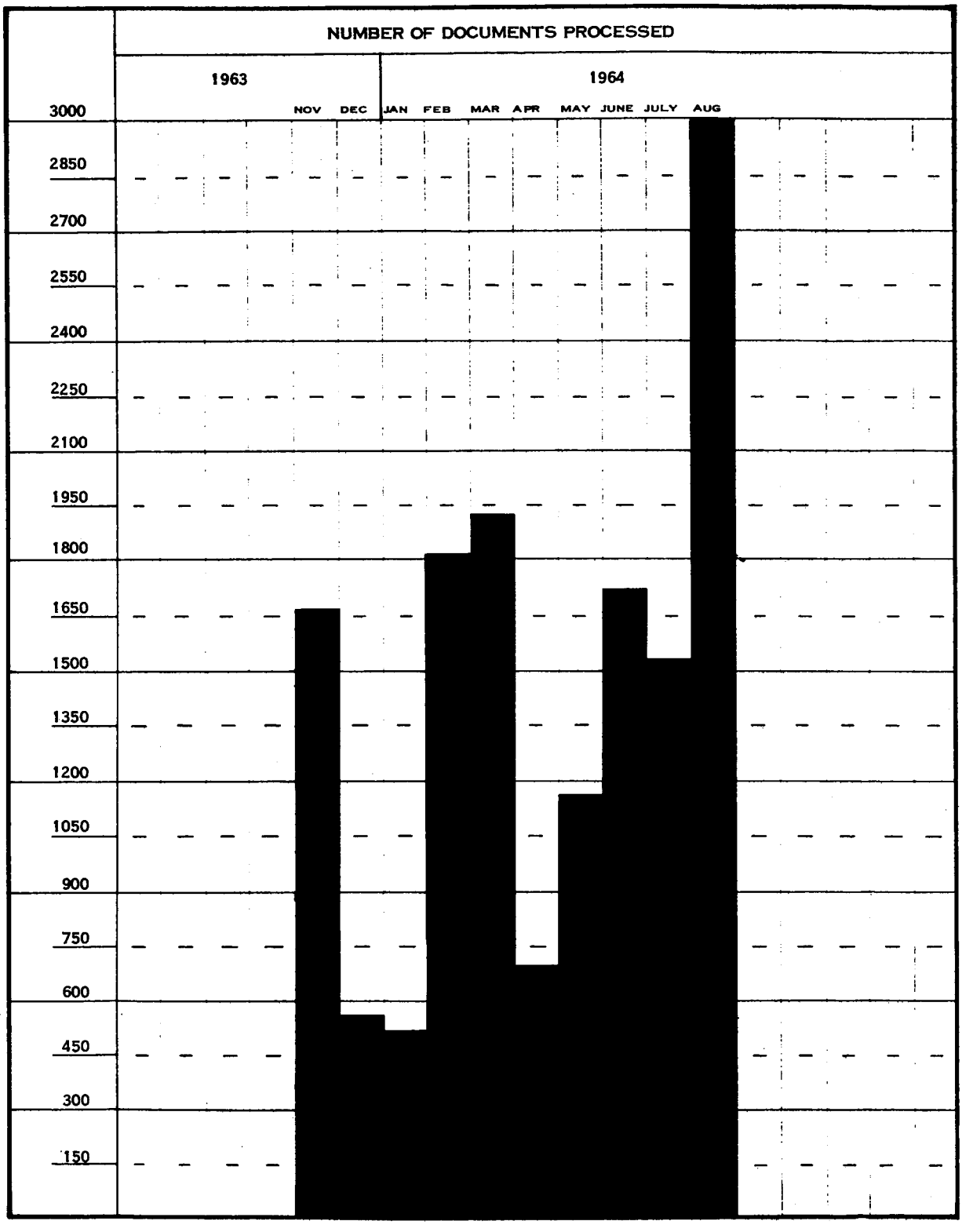


FIGURE 9. NUMBER OF DOCUMENTS PROCESSED

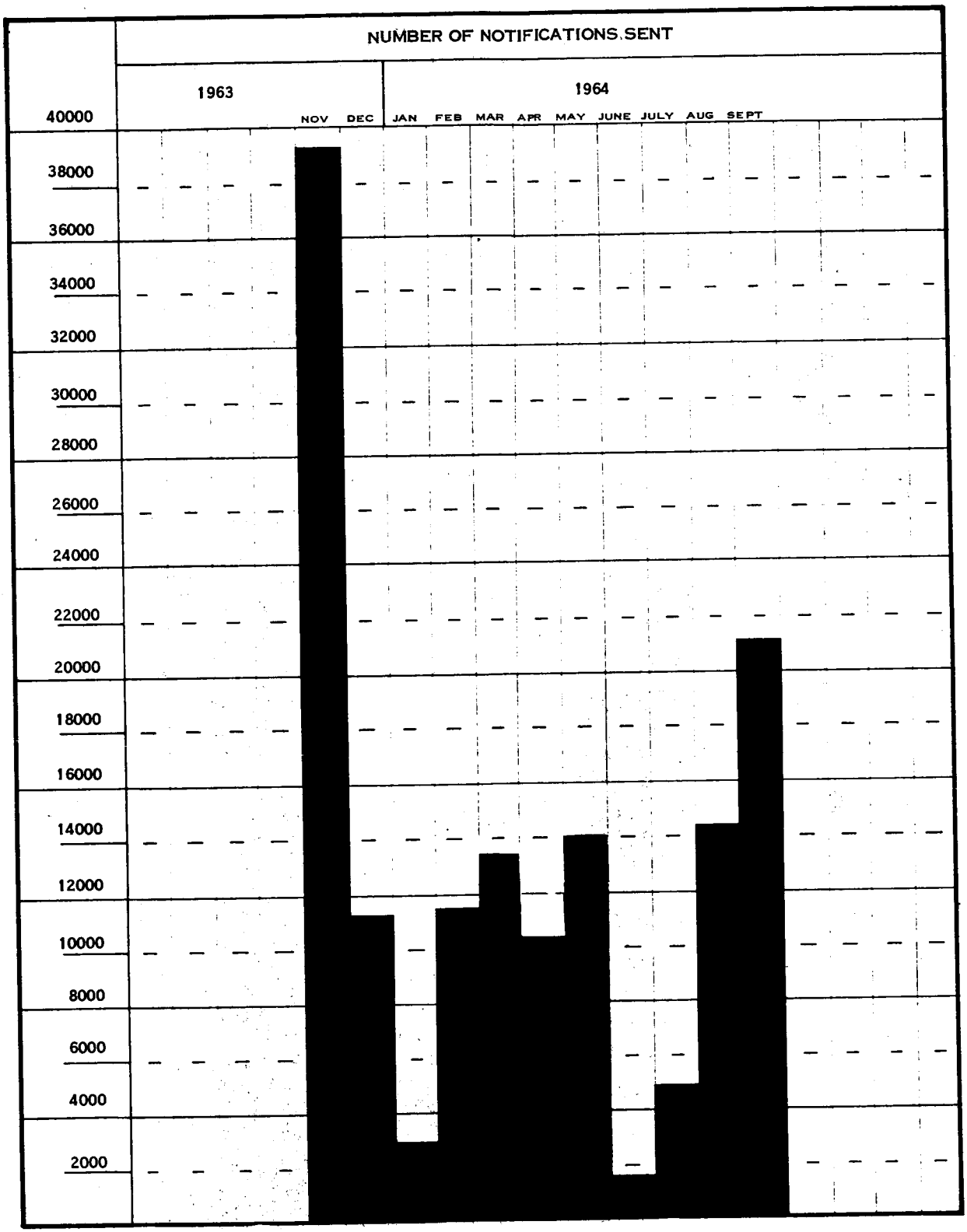


FIGURE 10. NUMBER OF NOTIFICATIONS SENT

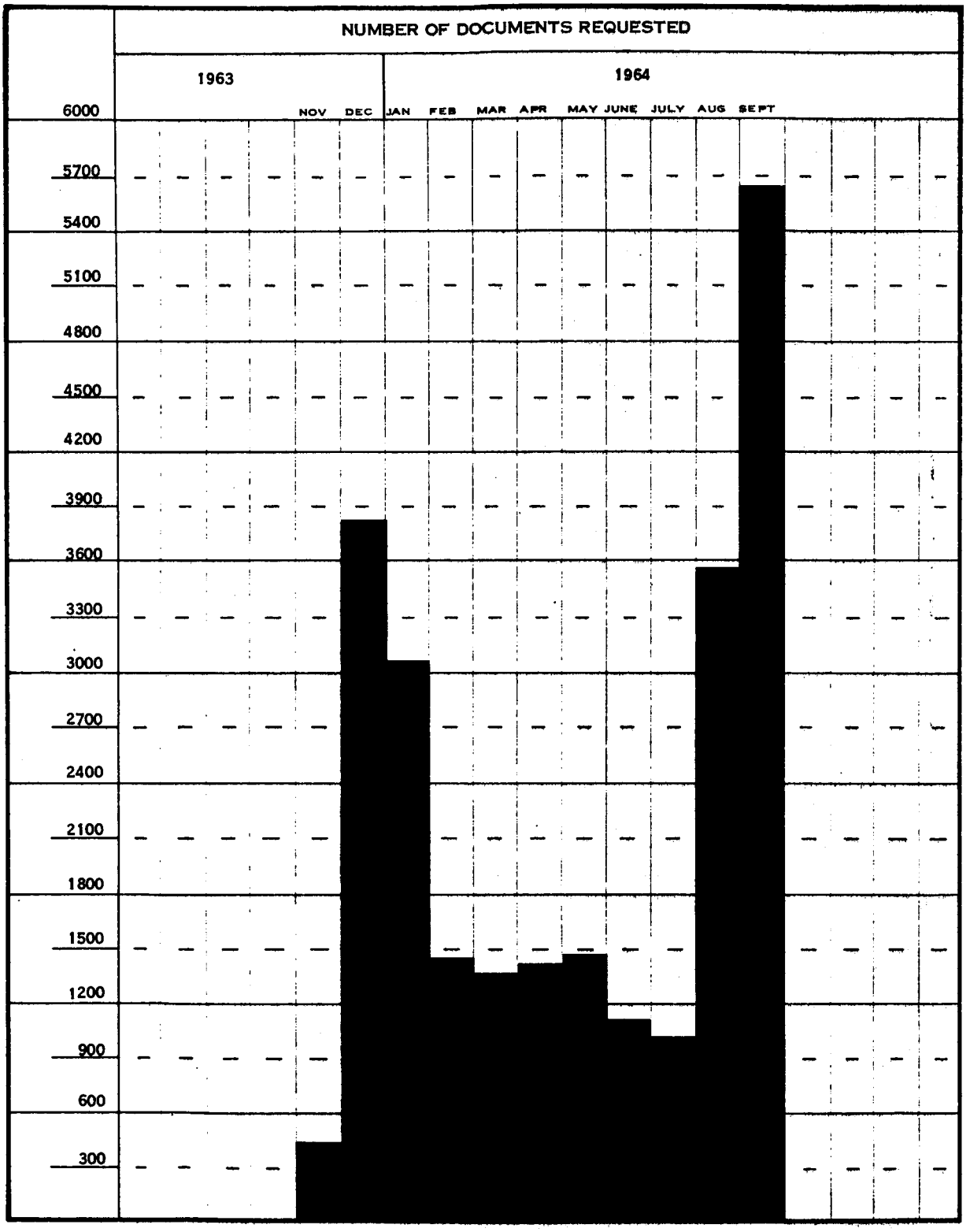


FIGURE 11. NUMBER OF DOCUMENTS REQUESTED

Therefore, the figures for non-random notices in both phases have been adjusted to incorporate the average 16% of no-responses reallocated according to the percentages given above.

1.2 Phase I, Part I

Phase I has been divided into two parts for analysis. Part I includes only the first semi-monthly STAR issue processed. This issue is analyzed separately because the system was being "shaken down" during this time. A great many notifications of very marginal relevance were sent out because the percentage matching procedure required that too few words match for notification. Since the results are quite atypical, inclusion with the rest of Phase I was avoided in order not to confound the later results. The results for Part I are presented in Figure 12.

Those locations or sites which participated in Part I of Phase I are Ames Research Center, Goddard Space Flight Center, NASA Headquarters, Manned Spacecraft Center, George C. Marshall Space Flight Center, Langley Research Center, Lewis Research Center, and Jet Propulsion Laboratory.

In Part I of Phase I, 20% of non-random notices represented documents that were requested, while an additional 27% represented documents which the subscriber believed were of interest to him but of which he did not desire a copy. These contrast with a figure of 8% for random notices of documents which were of interest and requested and 15% which were of interest but not requested. Seventy-three percent of the random notices were considered of no interest, as opposed to 53% of the non-random. (Bear in mind that the figures for random notices are not adjusted for the 4% of no-response random notices.) The non-random figures, 47% of interest, indicate that the matching portion of the program was functioning in a manner significantly more selective than would a purely random procedure, but the random figures indicate that many documents, 23% of interest, were being missed by the procedures utilized.

The total number of subscribers who received notices in Part I, Phase I, was 410. The number ranged from 28 at Jet Propulsion Laboratory to 80 at George C. Marshall Space Flight Center. These individuals received from 1 to 375 notices each. The average number of notices per individual, excluding Jet Propulsion Laboratory (see note, Figure 12), ranged from 62 to 80. Almost 97% of the notices mailed were returned; 97% of the non-random and 96% of the random.

The ranges of responses to notices at all participating sites are given below:

Part I, Phase I, Non-Random Notices

(1)	Of interest, document requested	16-26%
(2)	Of interest, document not wanted	22-31%
(3)	Of interest, document seen before	1- 4%
(4)	Of no interest	47-58%

PART 1, PHASE 1

No. of Participants	Locations	Avg. No. Of Notices Per Individual	Range of Items Received by Individuals	NON-RANDOM								RANDOM									
				Of Interest Doc. Requested		Of Interest Doc. Not Wanted		Of Interest Doc. Seen Before		Of No Interest		Of Interest Doc. Requested		Of Interest Doc. Not Wanted		Of Interest Doc. Seen Before		Of No Interest		No Response	
				No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
410	Aggregate	66	1 - 375	5409	20	6549	25	547	2	13596	53	36	8	61	14	4	1	315	73	17	4
33	Ames	78	5 - 379		25		26		2		47		8		15		-		77		-
44	Goddard	66	1 - 354		16		31		1		52		5		5		-		79		11
52	NASA Hq.	75	4 - 331		17		23		4		56		7		18		5		68		2
39	Manned Space-craft Center	80	4 - 353		26		24		1		49		12		17		-		69		2
80	Marshall	60	2 - 272		21		26		3		50		12		20		-		58		10
65	Langley	62	4 - 375		18		22		2		58		4		9		1		86		-
69	Lewis	68	1 - 213		19		25		1		55		10		10		-		80		-
28	JPL*	32	1 - 140		24		22		2		52		7		17		-		69		7

*Variability in the "Range of Items Received by Individuals" and the "Average No. of Notices per Individual" for JPL is due to its entering the Program several months after the other participating organizations.

SUMMARY

	Notices Mailed	No. of Responses Received	Responses as % of Notices Mailed
Total	26,903	25,962	97%
Non-Random	26,470	25,546	97%
Random	433	416	96%

FIGURE 12

Part 1, Phase 1, Random Notices

(1)	Of interest, document requested	4-12%
(2)	Of interest, document not wanted	5-20%
(3)	Of interest, document seen before	1- 5% (0, 6 sites)
(4)	Of no interest	58-86%
(5)	No response	2-11% (0, 3 sites)

1.3 Phase 1, Part 2

All of the sites which participated in Part 1, Phase 1, also participated in Part 2, with the addition of John F. Kennedy Space Center. The results for Part 2 appear in Figure 13.

The must capability, previously described, was added to the System during Part 2 in March 1964, in an effort to reduce the miss indicated by the random notices in Part 1. Also, the number of words required to match for notification was raised, in an effort to reduce the quantity of irrelevant notifications, and this number was also made a function of the length of the document profile. The results combine the must notices with the standard notices under the single classification of non-random. The non-adjusted figures for must notices are shown separately below:

Part 2, Phase 1, Must Notices

(1)	Of interest, document requested	16%
(2)	Of interest, document not wanted	24%
(3)	Of interest, document seen before	2%
(4)	Of no interest	38%
(5)	No response	28%

In Part 2, Phase 1, 23% of non-random notices represented documents that were requested, an improvement of 3% over Part 1. Fifty-seven percent of the notices were rated as of interest, whether requested or not, an improvement of 110%. On the other hand, 39% of the random notices were rated as of interest, versus 27% in Part 1, an increase of 12%. Eighty-nine percent of all notices sent were returned, an 8% decrease from Part 1; 89% of the non-random and 88% of the random were returned.

The number of subscribers receiving notices in Part 2, Phase 1, was 428. The number participating at the various sites ranged from 10 at John F. Kennedy Space Center to 74 at the Lewis Research Center. As few as 3 and as many as 1342 notices were received by an individual. It should be noticed that in a number of cases one "subscriber" was representing a group of individuals who were contributing their interests to a joint profile. This "subscriber" could therefore be expected to receive a larger number of notices. The average number of notices received by individuals at the sites ranged from 53 to 197.

Part 2, Phase 1 & Phase 2

No. of Participants		Location	Range of Items Recd. By Individuals		Avg. No. Notices Per Individual		NON-RANDOM														RANDOM											
							Of Interest, Doc. Requested				Of Interest, Doc. Not Wanted				Of Interest, Seen Before				Of No Interest				Of Interest, Doc. Requested				Of Interest, Doc. Not Wanted				Of Interest, Seen Before				Of No Interest				No Response			
Phase 1	Phase 2		Phase 1	Phase 2	Phase 1	Phase 2	No. 1	%	No. 2	%	No. 1	%	No. 2	%	No. 1	%	No. 2	%	No. 1	%	No. 2	%	No. 1	%	No. 2	%	No. 1	%	No. 2	%	No. 1	%	No. 2	%	No. 1	%	No. 2	%	No. 1	%	No. 2	%
428	660	Aggregate	3-1342	1-638	127	44	15422	23	8798	26	20787	31	11167	33	2012	3	1353	4	28833	43	12520	37	699	9	112	6	1320	17	242	13	78	1	19	1	4737	61	1005	54	932	12	484	26
32	36	Ames	21- 616	6-488	156	67		32		32		27		27		4		3		37		38		9		7		11		9		1		-		59		50		20		34
38	41	Goddard	14-1135	4-322	150	56		15		27		31		34		3		3		51		36		12		8		12		13		1		-		67		71		8		8
54	59	NASA Hq.	4-1643	3-369	175	58		17		17		33		33		6		6		44		44		7		4		27		17		3		1		52		52		11		26
44	46	Manned Spacecraft Center	7-1342	4-344	197	67		26		32		25		30		2		3		47		35		10		8		16		14		1		-		54		47		19		31
73	74	Marshall	12- 712	3-178	135	48		22		23		36		41		4		3		38		33		8		4		19		20		1		-		61		53		11		23
57	58	Langley	9-1327	4-638	152	53		24		28		32		33		3		4		41		35		7		6		12		16		1		1		70		57		10		20
74	76	Lewis	5- 498	2-401	138	47		24		26		31		32		3		3		42		39		9		5		17		11		1		1		65		63		8		20
46	56	JPL	9- 410	1-197	55	28		30		27		29		24		3		2		38		47		10		8		13		11		1		-		59		62		17		19
10	11	JFK	3- 380	10-201	53	51		14		21		48		56		1		2		37		21		3		-		28		26		-		-		56		40		13		34
	11	Flight Research Center	Not Participating	14-208		62				25				32				2				41				12				8				-				38				42
	32	HQ OAR	"	1-220		28				32				41				6				21				-				16				-				42				42
	11	RADC	"	1-325		52				19				21				2				58				-				-				-				40				60
	13	Kirtland	"	1-222		26				18				41				3				38				-				-				-				17				83
	93	Wright-Patterson	"	1-410		19				26				38				6				30				5				2				-				37				56
	23	Hanscom AFB	"	1-306		42				34				30				4				37				-				-				-				6				94
	3	Bolling AFB	"	2- 25		15				29				31				4				36				-				-				-				-				-
	9	AF Academy	"	1- 96		15				14				10				1				75				22				-				-				45				33
	2	Andrews AFB	"	10- 11		11				63				16				-				21				50				-				-				50				-
	6	ENT AFB	"	1-156		30				38				54				1				7				-				33				-				-				67

FIGURE 13

Summary

	Notices Mailed		No. of Responses Received		No. of Responses Received as % of Notices Mailed	
	Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2
Total	74,820	35,700	66,590	24,376	89	68
Non-Random	67,054	33,838	59,678	23,010	89	68
Random	7,766	1,862	6,834	1,378	88	74

The ranges of responses to notices at all participating sites are shown below:

Part 2, Phase I, Non-Random Notices

(1)	Of interest, document requested	14-32%
(2)	Of interest, document not wanted	25-48%
(3)	Of interest, document seen before	1- 6%
(4)	Of no interest	37-51%

Part 2, Phase I, Random Notices

(1)	Of interest, document requested	3-12%
(2)	Of interest, document not wanted	12-28%
(3)	Of interest, document seen before	1- 3%(0,1 site)
(4)	Of no interest	52-70%
(5)	No response	8-20%

1.4 Phase II

All previously participating sites continued in the program in Phase II. The following locations were added: Flight Research Center, Headquarters Office of Aerospace Research, Rome Air Development Center, Kirtland Air Force Base, Wright-Patterson Air Force Base, Hanscom Air Force Base, Bolling Air Force Base, Air Force Academy, Andrews Air Force Base, and Ent Air Force Base. The results for Phase II appear in Figure 13.

In Phase II, some of the matching procedures designed especially for NASA were in operation: must capability, not capability (exclusion), and a percentage match based on both document and user profile length. These were all previously described. The non-adjusted figures for must notices in Phase II are almost identical with those for Part 2 of Phase I:

Phase II, Must Notices

(1)	Of interest, document requested	18%
(2)	Of interest, document not wanted	22%
(3)	Of interest, have seen before	3%
(4)	Of no interest	30%
(5)	No response	27%

For Phase II, 26% of the non-random notices represented documents which were requested, a further 3% improvement over Part 2, Phase I. Sixty-three percent of the notices represented documents of interest whether requested or not, a 6% improvement over Part 2. Only 37% were of no interest. Forty-six percent of the random notices were regarded as of interest, an increase of 7% over the results obtained in Part 2.

The number of subscribers receiving notices in Phase II was 660. One site had only 2 subscribers, while another had 93. As few as 1 and as many as 638 notices were received by an invidividual during this Phase. The average number received by an individual at a given site ranged from 11 to 67. Sixty-eight percent of all notices sent were returned, a decrease of 21% from Part 2; 68% of the non-random and 74% of the random notices were returned. The decrease in the number of notices returned as the program continued in operation may be a result of the increased volume of notices sent out as the system handles progressively larger amounts of information with greater efficiency.

The ranges of responses to notices at all participating sites are shown below:

Phase II, Non-Random Notices

(1)	Of interest, document requested	14-63%
(2)	Of interest, document not wanted	10-56%
(3)	Of interest, have seen before	1- 6%
(4)	Of no interest	7-75%

Phase II, Random Notices

(1)	Of interest, document requested	4-50%(0,7 sites)
(2)	Of interest, document not wanted	2-33%(0,6 sites)
(3)	Of interest, have seen before	1- 1%(0,16 sites)
(4)	Of no interest	6-71%(0,2 sites)
(5)	No response	8-94%(0,2 sites)

1.5 Withdrawals

The last set of results to be dealt with concerns withdrawals from the program, presented in Figure 14. All withdrawals from both phases are treated together. Fifty-one subscribers withdrew from the program during the time period being considered. The overall results for these former participants appear to be comparable with those of persons who stayed with the program.

1.6 Comments and Conclusions

During the operational period of the NASA-SDI System at IBM,

WITHDRAWALS

Number of Withdrawals	Range of Items Received By Individuals	Average No. of Notices Per Individual	NON-RANDOM								RANDOM									
			Of Interest, Doc. Requested		Of Interest, Doc. Not Wanted		Of Interest, Seen Before		Of No. Interest		Of Interest, Doc. Requested		Of Interest, Doc. Not Wanted		Of Interest, Doc. Seen Before		Of No Interest		No Response	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
51	3-987	128	1269	21	1639	28	207	3	2834	48	25	4	58	9	1	1	353	59	158	27

SUMMARY

	Notices Mailed	No. Of Responses Received	No. of Responses Received as % of Notices Mailed
Total	6544	4782	73
Non-Random	5949	4345	73
Random	595	437	73

FIGURE 14

145,765 notices were mailed and 122,051 responses were returned, a return rate of nearly 84%. Of these responses, almost 22% were requests for documents; at the same time, only 3% were statements that the documents had been seen before SDI notification. These results, in conjunction with the replies to the questionnaires (see Section 2 following), indicate that the SDI System was instrumental in notifying participants of many documents that they would not have known about otherwise. The low 3% "have-seen" rate is particularly interesting in view of the fact that in many instances STAR was available to the system participants before the corresponding SDI notifications were distributed. This result points out the important SDI attributes of selectivity and ease of use.

Though the percentage of notices announcing documents of interest substantially exceeded those of no interest, 55% versus 30%, there does seem to be room for improvement in this area. It is quite difficult, however, to make a sound judgment of what would be a satisfactory percentage for "of-interest" notices, as there is no way of knowing with any certainty how many documents announced by SDI either would have been discovered or overlooked by the subscribers, had they not been participating in SDI. For example, if an individual were able ordinarily to find 5% of these documents containing information he wanted, any system which supplied him with 10% would be twice as effective as his standard methods. In that case, 10% might be considered a highly satisfactory result. On the other hand, if the individual were able ordinarily to find 90%, a system which supplied 80% might be considered unsatisfactory. Of course, other vital factors, such as time required in searching, the value of the information gained, and the uses to which it is put, must also be considered.

The number of random notices for which documents were requested was comparatively small (Figures 12 and 13), which is as it should be. This indicates that the subscribers are regularly being sent notices of nearly all the documents they want to read in full.

The fact that the percentages of documents requested or of interest among the non-random notices was somewhat higher than for must notices may indicate that the must descriptors being chosen are too broad in their usage and that greater selectivity should be exercised in choosing them.

The increase in the percentages of documents requested and of interest from Part I and Part 2, Phase I, and then to Phase II, 47 to 57 to 63%, indicates that system performance was steadily improved during the operational period. Of course, this does not mean that maximum performance has been attained. Unfortunately, due to programming difficulties, the full capabilities of the NASA-SDI System were not available until the conclusion of the operational period of the program. Now that these capabilities are in existence and as further operational experience is gained by NASA's Scientific and Technical Information Facility, higher performance levels should certainly be attainable with the NASA-SDI System.

2. Questionnaire Results

The NASA-SDI System is providing a valuable service to many of its subscribers and is functioning in satisfactory fashion though there is room for improvement, particularly in the development of more effective user profiles and in prompter filling of document requests in full-size legible form. These are the overall conclusions to be drawn from the answers subscribers made to the questionnaire submitted to them by IBM towards the end of the operational period. The specific conclusions and comments presented below represent four categories: general system operation, documents included in the system, usefulness of notices and contribution to work effort, and supplying of document copies. A detailed analysis of the questionnaire appears as Appendix 2.

General System Operation

Three criteria of general system operation from the user's viewpoint are:

(1) Is he receiving notifications quickly enough?

(2) Are these notifications current and pertinent to his work?

(3) Are requested documents supplied within a reasonable time?

Users of the NASA-SDI system overwhelmingly approved the speed of notification, NASA 90%, AF 70%* (question VIII). They also stated definitely that the information was current, NASA and AF, 92% (q.IX), as well as pertinent, NASA 85%, AF 56% (q.II). Finally, they agreed that requested documents were being supplied within a reasonable time, NASA 86%, AF 60% (q.X). Some confusion does exist among the users regarding the operation and objectives of the system, as demonstrated both by individual comments and by the overall way in which some users answered the questionnaire. But, to be fair, such confusion is probably not inherent in the system itself. The difficulties arise out of incomplete or poor communication between the system and the individuals it serves as to its operation and objectives.

* The differences between NASA and AF responses to the questionnaire are largely attributable (1) to the length of system participation, NASA ten months, and AF two months, (2) to the fact that the NASA STAR document input was probably less relevant in general to the work being done by the AF participants.

Documents Included in the System

Strong sentiment was expressed in the comments written by the subscribers for expanding the coverage of the SDI System. Requests were made for the inclusion of everything from technical journals, other abstracting services, materials and services used in aerospace manufacture and test equipment, preliminary and informal reports, to the Smithsonian Scientific Information Exchange. A number of requests were also made for the inclusion of classified information. However, some of the subscribers apparently do not know the source of the abstracts they are now receiving through SDI.

Usefulness of Notices and Contribution to Work Effort

A number of people feel that the SDI system is not supplying them with enough relevant notices concerning the material in which they are interested. Fifty-one persons commented specifically in this vein in answer to question 1 alone. However, at the same time, much attention was also given to the interest profiles. Most of these subscribers felt that their problem with respect to relevant notices was due to inadequate profile preparation or failure to keep profiles up-to-date. Some of the cases where people receive too few abstracts may be due to the highly specialized nature of their work, in that few documents would be available.

Contrary to dissatisfaction with relevancy, however, the questionnaire replies indicate that a considerable number of subscribers (129, q.XII) are formally acting to supply information received from SDI to groups of various sizes. Other important items to note are the significant number of people who are using SDI as part of a group (37 group profiles at Ames), and the large number of people who say that they pass SDI information onto others for their use (NASA 81%, AF 52%, q.XIII). Apparently, many subscribers find the information they receive useful and important enough to be passed along. Furthermore, well-supported testimony indicates that the SDI program not only helps to keep subscribers professionally well informed (NASA 85%, AF 56%, q.II), but also makes a direct contribution to the work effort in which they are engaged (NASA 76%, AF 39%, q. II). A high percentage of the subscribers state that they retain at least some abstracts (NASA 90%, AF 79%, q. IV) and expect that the information furnished by SDI will prove useful in the future (NASA 93%, AF 80%, q. XV).

Supplying of Document Copies

Eighty-six percent of NASA subscribers and 60% of AF subscribers agreed that they had received document copies within a reasonable time (q.X). Therefore, the individual comments forwarded throughout

the operational period and made on the questionnaire regarding delays in document transmittal indicate that such delays are probably peculiar to specific locations and that the reasons for them might be uncovered through further specific investigation. But, a number of responses to question X as well as the nature of other comments indicate that some means of supplying urgently needed documents on an expedited basis should be considered. Sixty-nine percent of NASA users stated that they would prefer to receive document copies within one week with 24% stating a preference for three days or less.

At the various locations, document copies were supplied to subscribers either as regular full-size paper copies or in microfiche form. In some locations the microfiche was used by the user only to determine whether or not he really needed a full-size copy. There are obvious economies to be derived from such a procedure.

D. RECOMMENDATIONS

The following recommendations represent the composite of those received from participants in the program, liaison personnel at the various centers and the system operators.

1. The coverage of documents being announced through the SDI System should be increased to include the journal literature.

2. The descriptors which match between the user and document profiles should be printed on the notification card so that the user may be aware of why this particular notification has been sent to him. This in turn would be of valuable assistance in aiding the user to modify his profile.

3. The user should be given an option to control the quantity of notifications coming to him over some specified period, e.g., weekly, monthly.

4. Investigation should be made into the feasibility of allowing the user to specify given subject categories for which he wishes to receive information and to exclude all other categories. This could be an aid in profiling problems as well as allowing the user some control over the quantity of information received.

5. More public relations effort should be given to assure greater utilization of microforms as part of the NASA information program. The results appear to indicate that many people are not even aware of microfiche.

6. Faster turnaround time should be provided on copy requests when the user is requesting a full-size document.

7. Periodically, statistics should be provided to each user and the appropriate liaison personnel, to inform the user of how his profile has performed over a given period. This information would also be useful to the liaison personnel in assisting the user with profile modification.

8. Consideration should be given to providing the notification printouts on 8-1/2 x 11 sheets of paper or to providing multiple responses per envelope. This feature would make it more convenient for the user in that he would not have to open up multiple envelopes. In addition, there should be economic savings.

9. The second response card used for evaluating the relevance of the document should be eliminated since its function was primarily to evaluate the pertainence of the abstract to the document. The results indicate that the abstracts are fairly good representations of the contents of the document and therefore this particular feature need no longer be evaluated.

10. Effort should be allocated to more automated means of user profile preparation and modification in order to lessen the burden on the user and introduce further economies into the system.

11. Consideration should be given to allowing the user to "MUST" or "NOT" an entire phrase so that the criteria established by the system may be overriden by any user if he so desires.

12. More caution should be exercised in utilization of the "MUST" capability on single-word descriptors.

APPENDIX 1

Detailed Analysis of Returned Subscriber Questionnaires

The following is an analysis of the first 450 questionnaires (67%) returned of 674 sent to subscribers of the NASA-SDI Program. Of the subscribers, 470 were NASA personnel, most of whom had been in the program approximately ten months, and 204 were Air Force personnel who had been participating for approximately two months. Of the returned questionnaires, 336 were from NASA personnel and 114 were from Air Force personnel. This questionnaire was distributed just prior to the conclusion of the operational period. Its function was to furnish information which would assist in the evaluation of the experimental portion of the SDI Program and provide insight into possible future system modifications. Results for the NASA and Air Force personnel have been tallied separately but are shown together. Comments, however, have not been segregated. In most cases, the results attained from NASA personnel are more favorable to the program than those from the Air Force. This may be due to the short period the Air Force people have been subscribers and/or to the different nature of their jobs.

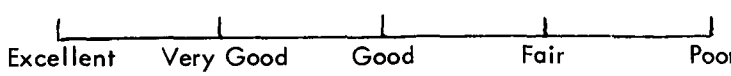
Each question will be shown exactly as it appeared in the questionnaire followed by the response received. Question 1 appears twice because it was distributed in two different forms.

1. What is your overall opinion thus far of the NASA-SDI Program:

    a. Excellent
    b. Very good
    c. Good
    d. Fair
    e. Poor

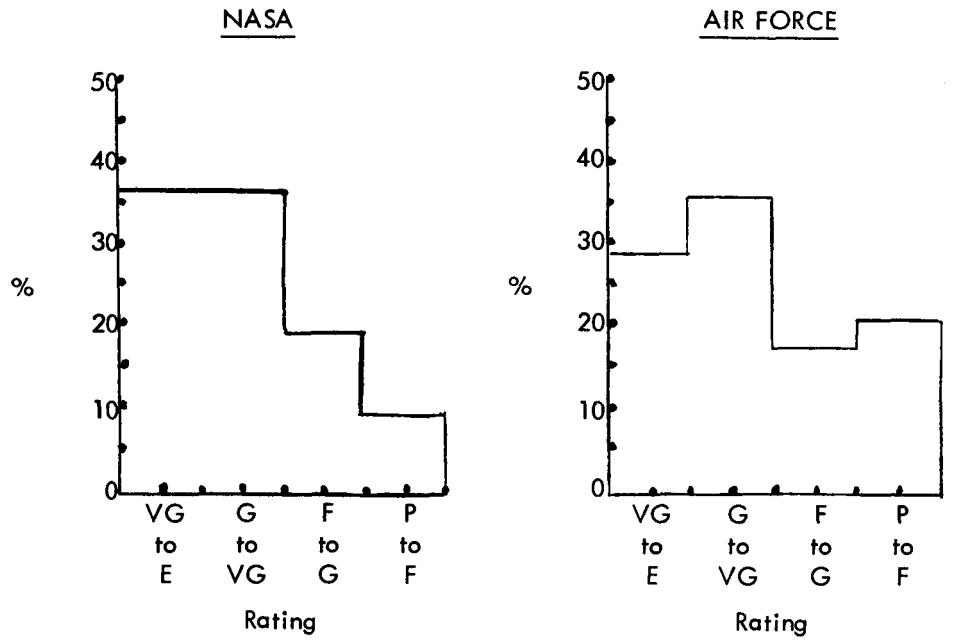
    If you answered poor, please indicate why.

1. Place a check at that point on the scale from excellent to poor at which you would rate the NASA-SDI Program.



    If you answered between fair and poor, please indicate why.

Of the 450 returned questionnaires included in this analysis, 434 answered this question; 328 of these from NASA and 106 from the Air Force. Of the responses, 223 were from people who used the scale and 211 from those who used the list. Combining the responses from both types of presentation, the respondents included in this sample rated the SDI System as shown in the following graphs.



Here are some of the significant responses to the second part of the question.

Fifty-one people felt that they were receiving too few abstracts of interest in their field or in proportion to the total number of abstracts they were receiving.

With these should be considered six people who thought some important information was being missed and six who thought that the coverage or scope of the program was too limited or inadequate.

Thirteen people mentioned that they were receiving requested documents too slowly or not at all.

Five people stated that they would prefer to scan STAR and/or the IAA abstracts to using SDI.

Three indicated that the microfiche was inconvenient to use.

Three felt that the deficiencies in the performance of the program were due to their own failure to provide and update a satisfactory profile.

II. Has the NASA-SDI Program helped you to keep informed in your professional area?

YES_____ NO_____

If so, has this knowledge contributed to your work effort?

YES_____ NO_____

If yes, would you please indicate any specific instances.

Respondents, 434: NASA, 331; AF, 103.

Part One

NASA		Air Force
85%	YES	56%
15%	NO	44%

Part Two

NASA		Air Force
76%	YES	39%
24%	NO	61%

Some typical comments made in response to Part 3 are listed below:

"Helped contact people doing similar work."

"Information contained in ARPA Report 363-62 was used in chart of the solar spectrum compiled by me and used by the NASA Environmental Criteria Subcommittee."

"Interest profile brings more abstracts than would normally scan without system. Personalized library service permits me to schedule time more effectively."

"Speeded up accumulation of data for report on space communications."

"Has made information available which helped to avoid duplication of effort i.e., our finding out independently what someone else had already discovered."

"Previously unaware of work completed in areas of flight simulation, pilot performance during low-altitude, high-speed flight, and several companies involved in fluid amplifier work."

"I became aware this way of several important references which otherwise would have escaped my attention."

"It has saved time because of its speed in getting recent information into my hands sooner."

"Design of one currently operating system was aided by a particular report."

"Report N64-20407 showed methods of joining steels to aluminum - this may turn out to be very useful in the case of small propulsion systems that we are building."

"(1) Allowed me to disseminate information to contractor and laboratory personnel which would be difficult for them to get, (2) insight into parallel programs."

"The program has provided references to several publications regarding computer programs for analysis of aircraft structures which I have obtained and used - specifically N64-20940, N64-20939, N64-20941 and N64-21439."

"I was not aware of many contracts covering work I was concerned with."

"My attention was called to specific R&D efforts which were rather closely related to programs in my office - as a result I believe I am in a better position to manage my programs."

"With the current rash of inconsequential and trivial papers on the increase, the abstracts have effectively helped screen useful papers for me. This has been particularly true in the shell buckling phenomenon as applied to SAT V and IB studies."

"In our 30 areas of research SDI helps establish state-of-the-art or point of departure for development work, avoids duplication, allows supplementary research to be coordinated."

"Knowledge of calculations already made (AD265059) on HeNe plasma, saved a duplication on our part (which had almost been done!)"

III. Indicate your reaction to the number of abstracts you have been receiving:

a. Receiving too many
b. Receiving an appropriate amount
c. Receiving too few

418 persons answered this question; 313 were NASA personnel and 105 were Air Force personnel.

NASA		Air Force
18%	Too many	8%
64%	Appropriate amount	52%
18%	Too few	40%

IV. Do you retain SDI abstracts of documents in which you are interested for your file:

YES_____ NO_____

If yes, what percentage?

Please approximate the number you have retained (about 100 per inch).

429 people responded to this question; 330 NASA personnel and 99 Air Force personnel.

Part One

NASA		Air Force
90%	YES	79%
10%	NO	21%

Part Two

NASA % of People Retaining that %	% of Abstracts Retained	Air Force % of People Retaining that %
5	5 or less	0
11	10-20	14
5	25-40	8
12	50-75	21
12	78-98	5
55	100	52

Specific figures given in answer to Part 3 ranged from 1 to 2000. A partial breakdown of

these figures is presented below. The significance of these figures, however, is quite limited, since the subscribers included in the sample have been in the system varying lengths of time.

% of Subscribers Retaining that No. NASA	No. of Abstracts Retained	% of Subscribers Retaining that No. Air Force
28	1-49	88
31	50-100	9
25	101-200	3
12	201-400	0
3	401-600	0
1	601-2000	0

V. Have the abstracts themselves been of any value to you other than to assist you in deciding whether or not to order a document?

YES_____ NO_____

If yes, please indicate what use you have made of the abstracts.

420 responses were received to this question; 328 from NASA personnel and 92 from Air Force personnel.

NASA		Air Force
41%	YES	30%
59%	NO	70%

Below is a general breakdown of typical responses for NASA and Air Force personnel combined who answered Part 1 affirmatively.

Response	% of People Making Response
General review, literature and work survey, and keeping abreast of work in field	38
File for future reference, bibliography and index	32
Routing to associates and subordinates	13
Substitute for full document	12
Material for speeches	1.5
Cross-file for microfiche	1.5
Keep track of loaned documents	.5
Suggested other approaches to problems	.5
Quick scan for responses to questions	.5
Search for sources of technical information	.5

VI. Had you consulted Scientific and Technical Aerospace Reports (STAR) prior to the introduction of the NASA-SDI Program?

YES_____ NO_____

If yes, are you still using STAR?

YES_____ NO_____

440 persons responded to this question; 333 were NASA personnel and 107 were Air Force personnel.

Part One

NASA		Air Force
77%	YES	49%
23%	NO	51%

Part Two

NASA		Air Force
76%	YES	50%
24%	NO	50%

VII. Have you, as a result of having had exposure to SDI, begun using STAR?

YES_____ NO_____

434 people responded to this question; 337 were NASA personnel and 97 were Air Force personnel.

NASA		Air Force
6%	YES	13%
94%	NO	87%

VIII. Is the speed at which you are receiving the NASA-SDI notifications adequate?

YES_____ NO_____

408 people answered this question; 311 were NASA personnel and 97 were Air Force personnel.

NASA		Air Force
90%	YES	79%
10%	NO	21%

IX. Is the information being furnished to you by SDI generally current?

YES_____ NO_____

If no, were you aware of it by some other source(s)?

YES_____ NO_____

If by some other source(s), please indicate which source(s).

407 people answered this question; 316 were NASA personnel and 91 were Air Force personnel.

Part One

NASA		Air Force
92%	YES	92%
8%	NO	8%

Part Two

NASA		Air Force
85%	YES	77%
15%	NO	23%

A generalized list of responses given by those answering Part 2 affirmatively follows:

Source	No. of People Naming Source
Scientific journals	5
Contact with personnel involved or original sources	5
Library acquisition lists	2
Distribution lists	2
STAR	2
Current Contents	2
Papers at meetings	2
General reading and reports	2
Grant monitoring	1
Government publication lists	1
Technical survey	1
AF Aero Propulsion Contracts	1
Preprints	1
Reprints	1

X. Did you receive documents requested as a result of SDI announcements within a reasonable period of time?

YES_____ NO_____

What is your estimate of the average time required for transmittal of the document to you?

a. 1 day
b. 2-3 days
c. 1 week
d. 2 weeks
e. Longer (indicate how long)

What time period would be most satisfactory for you?

387 people responded to this question; 315 were NASA personnel and 72 were Air Force personnel.

NASA	Part One	Air Force
86%	YES	60%
14%	NO	40%

NASA	Part Two	Air Force
0.5%	1 day	0%
7.0%	2-3 days	0%
37.5%	1 week	18%
36.0%	2 weeks	38%
19.0%	Longer	44%

NASA	Part Three	Air Force
4%	1 day	3%
20%	2-3 days	7%
45%	1 week	49%
25%	2 weeks	38%
6%	Longer	3%

The above figures show that 69% of the NASA personnel and 59% of the Air Force personnel would generally be satisfied if they received requested documents within one weeks time. They also indicate that though a two week waiting period is not necessarily a sign of dissatisfaction, neither does a one week delivery guarantee satisfaction.

XI. Do you use microfiche:

a. Regularly
b. Occasionally
c. Not at all
d. I am not familiar with it

Assuming that adequate reader equipment were available, would you consider prompt filling of a document request by microfiche preferable to waiting for full size reproduction?

YES_____ NO_____

429 responses were received to this question; 326 from NASA personnel and 103 from Air Force personnel.

Part One

NASA		Air Force
12%	Regularly	1%
32%	Occasionally	7%
19%	Not at all	30%
37%	I am not familiar with it	62%

Part Two

NASA		Air Force
45%	YES	33%
55%	NO	67%

XII. Have you made any other uses of information received through the NASA-SDI Program e.g., new contacts or new sources of information?

YES_____ NO_____

If so, please explain.

420 answers were received to this question; 316 from NASA personnel and 104 from Air Force personnel.

Part One

NASA		Air Force
13%	YES	12.5%
87%	NO	87.5%

Following is a broad categorization of the uses to which those replying affirmatively said the information was put:

Use	No. of People Naming Use
Knowledge of other people and organizations working in fields of interest and development of new contacts and sources of information.	33
Surveillance of foreign literature	2
Contracts for work in area of interest brought to attention	2
Frequent insights into new techniques	1
Information is fed into an existing AMES contract	1

New systems uncovered	1
Discovered common NASA-AF areas of interest	1
Advised others in AF of certain work	1
Develop and improve library	1
Reordered exceptionally cogent items in quantity	1
Material used to keep branch personnel informed	1

XIII. Did others make use of any of the information you obtain from SDI?

YES____ NO____

If yes, in what way?

415 persons responded to this question; 317 were NASA personnel and 98 were Air Force personnel.

Part One

NASA		Air Force
68%	YES	23%
32%	NO	77%

Among the ways in which the respondents said the information was used were:

Use	No. of People Naming Use
Circulate abstracts, microfiche and documents to associates, subordinates and superiors for reference, source development, general information, keeping up-to-date, and use of technical data for specific tasks.	129
For library or central file	8
Ordered documents through library	2
Answered questions and information requirements	2
As part of literature searches in related fields	1
Potential source of new ideas	1
Frequently able to refer others to better sources of subject in which they are interested	1
Indirectly through redirection of research effort	1
Award of a contract for research	1
Became interested in becoming SDI subscriber	1

The replies also indicate that a considerable number of subscribers are formally acting to supply information received from SDI to groups of various sizes.

XIV. Have you ever ordered a document from SDI for someone else?

YES____ NO____

Did you pass on abstracts or documents to others for their information?

YES____ NO____

439 people responded to this question; 333 were NASA personnel and 106 were Air Force personnel.

Part One

NASA		Air Force
49%	YES	16%
51%	NO	84%

Part Two

NASA		Air Force
81%	YES	52%
19%	NO	48%

XV. Do you think that information which has already been furnished to you by SDI will prove useful to you in the future?

YES____ NO____

Comments:

375 people answered this question; 287 were NASA personnel and 88 were Air Force personnel.

Part One

NASA		Air Force
93%	YES	80%
7%	NO	20%

Some of the more interesting and representative comments are reproduced below.

"When one has been exposed to what is available in the field, then a more complete follow-up can be made when specific problems arise."

"SDI is nothing more than the streamlining of the procedures for ordering things and has nothing to do with the usefulness of the material received."

"The microfilm of the reports of relevance will be useful for reference purposes."

"Planning future programs."

"Retention of abstract cards will prove of extreme interest to individuals responsible for broad research areas. This is almost as beneficial to me as initial contact with the material. It may no longer be necessary to retain large volumes of reports for reference purposes, since cards contain all the information necessary to obtain the report later."

"I would like to see the range of sources increased."

"The information built up my document library and improved my knowledge of the current state-of-the-art."

"I trust the cards will continue and since the Air Force has discontinued their file cards with each report - the SDI cards have been used."

"I would like very much to see this program continued with the inclusion of abstracts and availability of classified documents."

"I fully approve of the SDI program and believe that much valuable information can be received from it that otherwise would not be available so readily."

"I work in the field of reliability. The documents that I have received are on file and will be used as reference for future evaluations of contractor reliability procedures, especially in reliability predictions."

"I have enjoyed the up-to-date reviews on abstracts relative to my field. This selective method saved me time to be able to do other work."

"By the time the material is documented - it is too old - not a fault of SDI."

"I need a broad survey of certain activities, without depth, such as abstracts can often furnish. The NASA-SDI Program supplied me with material of only secondary interest."

"I believe that I obtain more complete coverage of my technical area than I did using STAR."

"This is basically a good system. The problem of maintaining a current interest profile, however, makes scanning of publications such as STAR necessary."

"When looking through STAR or International Aerospace Abstracts, I rarely see the same articles that I was notified of by SDI, so that SDI has become another literature source instead of replacing the need to look elsewhere."

"It has been more useful than STAR and more abstracts and useful information have been supplied to me through the SDI Program than I have been finding or taking the time to search for in STAR."

"In general the SDI Program may be very good, but it appears to me that the sources reviewed are too limited for at least some specialized fields."

"The value of research effort is directly proportional to the information we receive. A good system like this is vital, provided it is timely and comprehensive."

"(1) Abstract cards retained will provide a complete and thoroughly applicable bibliography in my fields of interest, (2) the continuing survey of literature of interest is and will continue to be of great value, (3) microfilm retained provides a small reference library since reader equipment is available."

"A practical and successful inroad to the problem of staying current. The mere bulk of new material, not to mention scanning and sorting time required, presents a completely overwhelming problem - and one that can not be solved short of the use of a system of this sort."

"SDI has allowed me to review current literature which I found in the past I could no longer do due to the lack of time and enormous amount of abstract information in circulation. I have come to rely on SDI for keeping up-to-date."

"Faster service is mandatory for information requirements."

"All our personnel feel this system has much greater value than scanning abstract compendiums at the possibility of missing one occasionally."

"Although the trial run was not too successful from my point of view, I believe the SDI System will eventually evolve into a most useful tool for research workers."

"I hope this program is continued since it has been very helpful."

"(1) Many abstracts contained pertinent data for immediate use, (2) many documents were not ordered because of a heavy work load. The abstracts were retained for future reference, (3) some abstracts were referred to other interested people. Many very interesting documents were not previously ordered because of limited time for reference work."

"This system appears to be the only way to keep current with the ever expanding volume of technical data."

XVI. Please list below any features which you would like to see added to or deleted from the NASA-SDI Program.

If you have any additional comments, please write them below.

Since very little or no distinction was made by the respondents in their replies between Parts 1 and 2, the answers to both will be treated together.

Some of the more interesting comments and suggestions are listed below:

"The major obstacle is the human element i.e., the 'Interest Profile'. The description and examples given at the beginning of the program were essentially well-defined. However, to assist those who were not satisfied with the results I suggest that a sample set of profiles be prepared from various fields and forwarded to all participants. These should be selected from profiles in use where the individual has experienced better than average success with the program. They would thus provide a basis for profile revision which I think would benefit all participants."

"It would be very helpful to know what keywords were responsible for each abstract being sent."

"The back of the punched card should have "return to library" stamped on back so as to be visible through the window and so that the same envelope can be used in returning the card to the library."

"Ability to limit certain categories to NASA or other publications."

"Ability to limit certain categories to reports published after certain dates."

"Random notifications should be replaced by notices of items characterized by broader terms in the same field or higher terms in the hierarchy, if applicable."

"Subject coding of abstract cards to allow files to be set up."

"Simple way of ordering reprints e.g., monthly selection of inputs put in book form and ability to check them off and return book."

"Would like to see mechanism for literature reviews built into system eventually."

"Increased communication between participants and program operators seems essential."

"Forget about catering to individuals. Establish about twenty basic categories. Let the subscriber choose those of interest. Send abstracts for final selection."

"I am not a good test subject since my interests are highly specialized, not closely associated with NASA and highly classified."

"Don't send the abstract until the library has the microfiche or the report available."

"It should be possible to order specific documents on an expedited basis."

"A program would be useful that searched out old as well as current literature on a very narrow subject."

"The program should be flexible enough to provide for the specific type of information and less intense coverage for a diversity of interest."

"Ability to order microfiche and full-sized copies immediately rather than sequentially."

"Detailed abstracts of all government contracts being awarded. The SDI approach may help to eliminate overlap of contracts being awarded because of lack of knowledge which is the main reason for this."

"Addition of a necessary but not sufficient word or phrase e.g., "nozzle" must appear, but if it does then a certain number of other words or phrases must be present. If "nozzle" does not appear, the report is not forwarded."

APPENDIX 2

Miscellaneous Forms

During the course of the NASA-SDI Program, several forms were prepared for various communications within the system. This Appendix illustrates these forms and explains their purposes briefly.

National Aeronautics and Space Administration

Office of Scientific and Technical Information-SDI Program

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION SELECTIVE DISSEMINATION OF INFORMATION (SDI) PROGRAM

A new system designed to improve technical communications by rapidly disseminating information about newly published material to NASA personnel has been instituted by NASA and IBM. It is presently processing all reports in STAR for which Microform copies are available.

You are invited to become a subscriber to NASA'S SDI Program by listing, on the attached form, those words which best describe your fields of interest using as a guide the attached subject listing. You may feel free to include any words or phrases not contained on this list. From documents, processed by the system, similar keywords are extracted and matched by computer with SDI subscribers' keywords. For each document selected as matching your work interest, a notification card with author, title, and an abstract of the document will be mailed to you along with a 'response' card. Upon receiving this notice you may order a copy of the document from your local library if it is available, indicate your interest or lack of interest in the document, or add any comments you wish by punching out the appropriate PORT-A-PUNCH position.

In selecting the words to describe your field of interest, you should keep in mind the following points.

1. Documents and user keywords are matched on the basis of a fixed number of words. It is to your advantage to have as many of the representative words or phrases applying to your area of interest, as are likely to appear in a document you would want to see. For example, if you were interested in communication systems you might list these keywords: communication systems, communication devices, telegraphy, telegraphic systems, telephony, transmitters, receivers, radio telegraphy, telemetry, information gathering systems, inductive field, toll recording, message exchange, radiant energy communication, printing telegraph systems.

2. Up to 600 keywords per user can be accommodated by the system, but it is unlikely that any user will require any number approximating this to achieve sufficient terminology with respect to the documents being processed. If, however, you have a variety of subject interests, each with unique terminology, you will need sufficient keywords to describe each subject. Experience has indicated, however, that any excessive number of keywords will produce many notices which may be extraneous to one's interest. Avoid general terms such as system, machine, devices, processing, etc., unless you wish to receive generalized information. Words of this type should be coupled with other words to form phrases, e.g. electrochemical devices, machine design.

3. Encircle any word or phrase which if contained in a document would cause a notifica-

IBM Advanced Systems Development Division. 2651 Strang Blvd.. Yorktown Heights. New York

FORM 1. Letter introducing the SDI System to NASA users, with particular reference to profile preparation.

tion to be sent to you even though none of your other keywords were present. As an illustration, if you were interested in receiving all documents which contained the phrase "radio telegraphy", you would encircle that phrase on your keyword list. This means that if this phrase were present in a document regardless of the context in which this phrase were used, you would receive a notification of the document. In order to utilize this feature it is imparitive that careful consideration be given to words or phrases selected for this purpose as misuse may cause receipt of a great deal of nonrelevant material. If this feature should yield unsatisfactory results, please notify our office so that appropriate changes can be made.

Since this is an experimental system, NASA and IBM plan to conduct experiments within the SDI System, which will occasionally affect, to some degree, the scope and effectiveness of the SDI Program. Your cooperation and participation in these experiments will permit them to develop and incorporate improvements in the system, increasing its present usefulness to you and other NASA personnel. All notices sent to you will be addressed for return to your library and will have PORT-A-PUNCH positions to be punched for your reply. It is essential that we receive your prompt reply to each notice. Please feel free to enter any comments that may help us to improve our service.

NASA'S SDI Program
IBM - ASDD
2651 Strang Boulevard
Yorktown Heights, N. Y.
PEekskill 7-6600, Ext. 669

FORM 1 (Continued). Letter introducing the SDI System to NASA users, with particular reference to profile preparation

SELECTIVE DISSEMINATION OF INFORMATION PROGRAM

FOR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AND

UNITED STATES AIR FORCE

Memorandum to: USAF Participants in the NASA-SDI Program

Welcome to NASA's SDI Program. Since you are a new user, we would like to take this opportunity to explain some of the pertinent features of the program's operation not covered in the brochure recently furnished to you. Periodically, you will be sent notices. These correspond to documents which the system deems to have a high probability of being relevant to your previously indicated spheres of interest.

The notice consists of two cards. The card containing the title, abstract, etc., is for your retention and may be filed in a 3 x 5 card file. The other card is a 'response' card which is to be returned to your local library or designated SDI contact point. In order that the system may take account of your changing interest or omissions in your keyword list, you should punch out completely the box on the stub which corresponds to your response to the notice. You may also indicate on this card any change of address, words to be added or deleted from your profile, other persons whom you think should also receive notification of the particular document, or any comments you may wish to make. We would like to know, for example, your preferences about the number of notices you receive. If you receive too many, or too few, please comment. You should also be aware that your profile is always available for any modification you may wish to make. Simply phone or write our office.

All requests for documents will be handled directly and promptly by your local library (SDI contact). The documents will be furnished to you in distinctive large SDI envelopes (blue). These envelopes are reusable and should be returned to your local contact point. If you find that it is unnecessary to keep any document copies you receive, you may return them to your library.

In order to facilitate the rapid handling of your responses, please be careful in pushing out the PORT-A-PUNCH chips. They should be completely removed from the card. If you make an error, the incorrectly punched hole can be corrected by covering it with any of the paper adhesive tapes.

We hope your first notice is of a document relevant to your expressed interests. In any case, please return the 'response' card to your local library (SDI contact) by simply dropping it in your internal mail system after indicating your response.

NASA'S SDI Program
IBM Advanced Systems Development Division
2651 Strang Boulevard
Yorktown Heights, N. Y. 10598
PEekskill 7-6600, Ext. 669

FORM 2. Letter introducing the SDI System to AF users.

NASA - SDI PROGRAM
IBM - ASDD
2651 STRANG BOULEVARD
YORKTOWN HEIGHTS, N.Y.

Name	Employee No.	Dept.
Division	Location	Bldg. #

INTEREST KEYWORDS
Please print or type

102

FORM 3. User Profile Blank

June 1963

NASA
SELECTIVE DISSEMINATION
OF INFORMATION
PROGRAM

This brochure is intended to describe the NASA-SDI system to prospective participants. Part I presents a general summary of the program, and Part II covers the preparation of individual profiles. Part II first presents a detailed description of the various matching techniques possible in the NASA program and then concludes with a section describing fully how a profile may be refined.

Questions on specific profiles and document announcements should be taken up through local representatives. General comments on the system and its operation should be made to NASA's Scientific and Technical Information Division, Code ATSD, Washington, D.C. 20546.

Scientific and Technical Information Division
National Aeronautics and Space Administration

FORM 4. Brochure describing the NASA-SDI System in detail. This brochure was prepared early in the test period in an attempt to provide prospective users with a manual on profile preparation that presented in some detail the operation of the system with respect to the user profiles.

NASA SELECTIVE DISSEMINATION OF INFORMATION PROGRAM

PART I: WHAT SDI IS

Behind the cryptic notation, "NASA-SDI," there is a simple purpose: to ease somewhat the scientist or engineer's task by telling him automatically, with minimum effort on his part, about new information that may be useful in his work.

The trouble with information is that there is too much of it, and the quantity will grow. The Information Avalanche has barely gained momentum.

Only a small part of the growing paper mass is of interest to any one individual. The pressing problem is how to separate his wheat from the chaff. The initial solution was to prepare quick, easily read abstracts; but even abstracts are becoming too numerous for an individual to scan.

The basic NASA abstract journal is STAR: Scientific and Technical Aerospace Reports. The first issue, in January 1963, contained a modest 86 pages covering 556 abstracts. Fifteen months later, the April 8, 1964, issue had 168 pages covering 1,112 abstracts. By plotting a probable growth curve over the next few years, you reach a point where only the most muscular construction stiff can even lift the journal, much less scan it easily. At present STAR is grouped into 34 fairly broad categories to aid in rapid scanning. But ease of scanning is not the only consideration. The more time an individual spends locating useful information, the less time he spends in productive work.

NASA's approach to the problem is the SDI System. SDI stands for Selective Dissemination of Information. It could also stand for Service Direct to Individuals.

The NASA SDI System was developed by IBM, which has been handling the pilot phase of the operation. The system is still under development, and will remain so for some time to come--even after it becomes operational at NASA Centers late in 1964. This apparent contradiction in terms means that enough data and experience have been accumulated to show that the system works, but that further improvement can result from more data and more

experience with a larger number of users. About 500 NASA scientists and engineers have participated in the developmental phase.

PILOT SYSTEM BASED ON STAR

Test journal for the SDI System is STAR, NASA's Scientific and Technical Aerospace Reports. This semi-monthly publication was chosen because it is the basic NASA information tool, is still of manageable size, and all its entries are covered by the NASA machine system.

Each report listed in STAR is indexed by a method called coordinate indexing, which differs from the standard library type of category indexing. Ten to twenty key words descriptive of the report's content may be chosen for the coordinate index. Together these words add up to a detailed profile of the report. Here are examples of coordinate indexes for some actual reports:

COORDINATE INDEXES FOR THREE TYPICAL NASA REPORTS

N64-14216	N64-14640	N64-14204
Accuracy	Case	Atomic
Air	High-strength	Cesium
Aircraft	Joint	Collision
Condition	Laminate	Converter
Information	Lap	Crystal
Landing	Light-weight	Electron
Lower	Material	Emission
Minimum	Motor	Generator
Path	Pressure	Molybdenum
Pilot	Rocket	Single
Safety	Vessel	Solar
Transport		Solar Energy
Weather		Thermionic (SET) Program
		Thermionic

Coordinate index terms are easily translated into machine language--an important point for SDI, because the machine, a 7090 computer, is the heart of the SDI program. (The SDI program can be adapted to any computer of sufficient capacity and speed.)

2

FORM 4 (Continued)

Once a report is coordinate-indexed and the index terms are translated into machine language, the information is fed into the computer memory bank. It is then available for machine bibliographic searches, for preparation of the semi-monthly issue of STAR--and for SDI.

The SDI system is a comparison between the report index information stored in the machine's memory and the interests of a particular individual.

To make the comparison, the individual's interests also must be fed into the machine. This requires that they first be described in appropriate language. The description is called the individual's interest profile.

ELEMENTS OF AN INTEREST PROFILE

Preparation of an interest profile takes thought, and periodic refinement and updating. Detailed notes on profile preparation are appended, and each NASA laboratory or installation has at least one resident expert in profile building. Briefly, however, a profile consists of terms and phrases that add up to a description of the individual's interests. The descriptive terms and phrases are supplemented by two special categories: must terms and not terms.

The list of single terms--for example, cryogenic, propellants, airfoils, heat shield, telemetry, etc.,--provides a statistical basis on which the machine can match the individual profile against the coordinate indexes or reports. If a pre-programmed quantity of terms match, the machine sends the individual an announcement card of the report.

Phrases--for example, transfer of cryogenic liquids under weightless conditions--form categories. The machine must find a good match between the phrase and the coordinate index terms before it will send a report announcement.

Must terms tell the machine it must send an announcement card whenever the term is located. Naturally, must terms should be used with discretion. For example, making anti-gravity a must term might result in an announcement occasionally, but making rocket a must term would cause such a blizzard of announcement cards that the whole office would become an in-basket.

3

FORM 4 (Continued)

Not terms, also to be used with discretion, tell the machine not to send an announcement card when it finds a term, even though the match between profile and index might otherwise be pretty good. For instance, an individual might be interested only in how prodsponders glock, while the bulk of the literature deals with how prodsponders wheap. His profile would then "not" the wheap and "must" the glock.

HOW THE SYSTEM OPERATES

The individual profile is translated into machine language and becomes part of the SDI program tape. When an SDI run is made, the machine compares profiles with report indexes. When profile and index match, the machine flips out a card addressed to the individual. With this card is a detail card containing title, report number, source, authors, and an abstract.

The individual gets the cards in the mail and reads the abstract. If he wants the full report, he need only punch out a little die-cut window in the response card. One poke of a pencil does the trick. If the report is not of interest, there is a different window to poke out. If the report is of interest, but for some reason no copy of it is wanted, there is a third window to push out.

If the individual calls for the report by punching out the proper window, he automatically gets a copy from his local library. It may be a full-size copy or a reproduction "hard copy" from microform, depending on the resources of his library. Accompanying the report is another card. By punching out the proper window, he advises the system whether or not the full report turned out to be interesting and useful.

The computer makes runs periodically on all returned cards and uses the statistics to check on the system. That's why there is a choice of holes in the card. The more complete the responses from SDI users, the better the statistics on which improvement of the system is based.

HOW WELL DOES IT WORK?

If machines and men were perfect, if the English language was non-redundant and semantically accurate, the SDI system could work

with the kind of perfection achieved only in Nirvana. But this is an imperfect world, and the system takes thought and effort to achieve a useful order of accuracy without ever hoping for overall perfection.

In an ideal system, the individual would receive announcement cards for every available report within his field of interest--and would not receive notices of reports outside his interests or of only marginal interest. This ideal can be achieved, theoretically, where the field of interest is narrow and sharply defined and has a non-ambiguous terminology. Unfortunately, from this viewpoint solely, scientists and engineers have pretty broad interests, and the language is imprecise and full of synonymous words and phrases. Nevertheless, a high batting average can result from care in using the system.

Each time an individual orders a report, or punches out the window meaning "of interest but not wanted," is called a hit. Each time the machine fails to send an announcement card on a report of interest is a miss.

The hits are easy enough to check. Running the returned cards through the machine produces a statistic on how many cards were sent and how many of those were hits.

Checking on misses is more difficult. The best way, although somewhat time consuming, is for each individual to check the announcement cards he receives against the current issue of STAR. If a report of interest is listed in STAR but no card is received, it's a clear miss. Examination of the report usually shows how the individual's profile should be amended to eliminate misses of that particular kind. Of course this procedure is for use primarily during the developmental phase of SDI; it should not be necessary when the program becomes operational--although an occasional check of cards against STAR or other journals covered by the operational program would be useful.

SDI hedges its bets by a machine technique in case not all users are meticulous or faithful about checking for themselves. During each run some reports are selected at random, and announcements sent to a random selection of individuals. If the individual returns a random card with a positive indication of interest, it means the machine did not make the proper match during the non-random program run. The individual is then invited by a follow-up card to revise his profile accordingly.

5

KEY TO SUCCESS: YOUR PROFILE

Clearly, the individual's profile is the key to SDI success. A good profile brings good results. Too broad a profile brings too many announcements of reports that are of no interest. Too narrow a profile causes the machine to fail to match individual interests with reports of value. The machine, after all, is not very bright. It can do only what it is programmed to do. This it does with speed and efficiency, but with no flexibility whatever.

Profile development as the key to successful SDI operation is shown in the program statistics. During the first month of SDI, with slightly over 400 NASA scientists and engineers participating, a hit average of something over 40 percent resulted. That is, of each 100 notification cards received by an individual, an average of about 40 were of interest. Immediate refinement of the system began, first by changing the matching statistics of the computer's program, then by profile refinement. Within three months, the hit average went up to 65 percent. With further refinement based on longer experience with more individual participants, a hit percentage of 75 percent is predicted.

TOWARD A DECENTRALIZED SYSTEM

The operational phase of SDI is already in sight. The exact timing will vary from place to place. Because NASA's approach to efficient scientific and technical information dissemination is decentralization, only the basic work of accession, indexing, and tape punching is performed centrally; but copy tapes and reproducible microfiche of the reports are sent to the field Centers, so that many will operate their own SDI program. Each Center will decide for itself when it is ready to move from the centralized developmental phase to the local operational phase with its greatly expanded number of participants.

When SDI goes operational, the first step in expansion of source materials will be to include International Aerospace Abstracts (IAA), prepared semi-monthly for NASA under contract by AIAA. IAA covers worldwide journal literature in aerospace sciences just as NASA's own journal, STAR, covers worldwide report literature. Later, other abstract journals may be programmed into the system.

6

FORM 4 (Continued)

So far, the statistics of success are encouraging, but they represent the average of hits over a sample of 500 participants. Interviews with the participants and examination of individual results showed an actual spread from highly satisfied to grossly disappointed users. Some had developed such confidence in the system that they stopped checking STAR, depending entirely on SDI to call new reports to their attention. At the other extreme were individuals with a high percentage of misses and a heavy flow of non-pertinent announcement cards. The key in every case was profile adequacy. The happy clients had good profiles. The unhappy ones did not.

PART II: PREPARATION OF INTEREST PROFILES

To prepare a good interest profile takes time, thought, and revision. The famous comment about great literaty works also applies to profiles: Great works aren't written--they're rewritten. So start with the assumption that whatever profile you produce on the first try must be reviewed frequently and refined as necessary until you are satisfied that the SDI System is working well for you. Even then, it's a good idea to make a periodic review to be sure that all changes in your work interests are covered and that past interests are dropped.

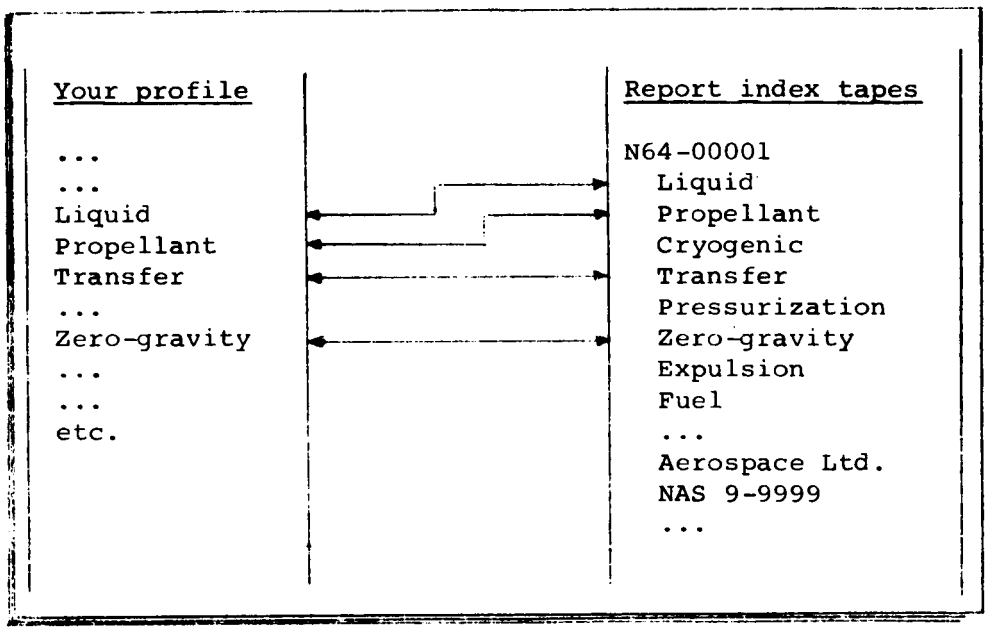
Profile preparation starts with an understanding of the SDI matching process. Remember that your profile is to be matched against report indexes that have been prepared by professional indexers. Index preparation is an art, too, but that's not your problem--other people are concerned with constant improvement of indexing. Sometimes the number of coordinate terms used for a report index may exceed 20 or even 30--but the number of words you can use in a profile can exceed 4,000! Of course the individual profile uses only a tiny fraction of this machine capacity, and the figure is cited only to show that you need not feel restricted in your use of language in preparing a profile.

Once the computer has learned your profile, it is ready to begin scanning for information of use to you. It does not do this by scanning the reports themselves, nor the abstracts, nor the titles. Its scanning is restricted to the coordinate index terms fed into it on a magnetic tape.

HOW THE MATCHING PROCESS WORKS

As the computer scans the magnetic tape (which contains the index terms for the reports to be announced in the current issue of STAR), it compares the terms on the tape with the terms in your profile. This is done in one or more of the following ways:

TERM MATCH. The computer may match by a given number of terms; four in the following example:

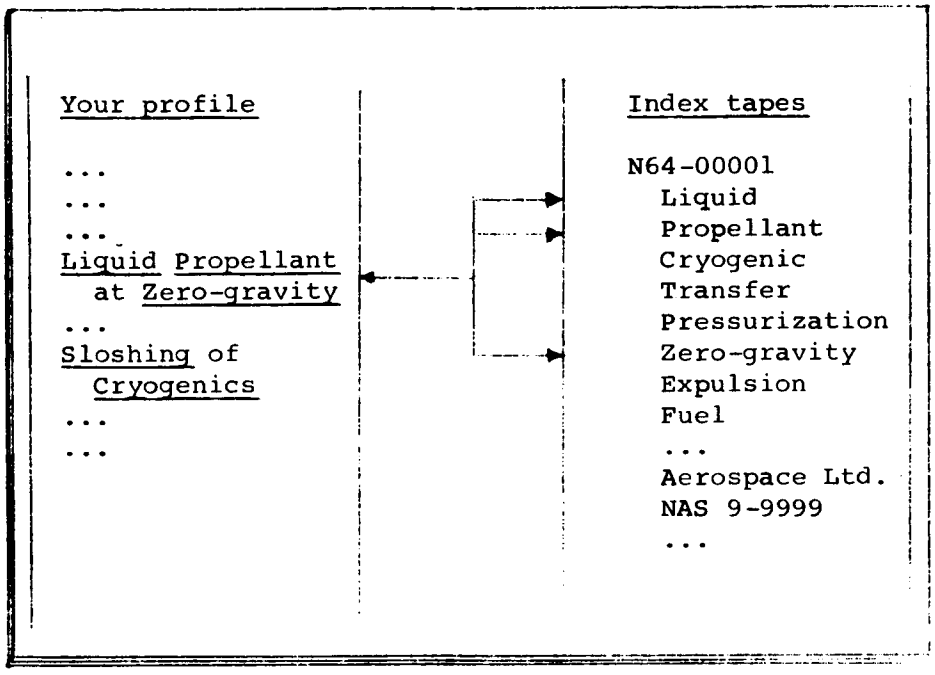


The fact that four terms (or a preset percentage such as 25%) are identical in both profile and index results in your receiving an announcement of this report. The operator of the NASA-SDI system also can instruct the computer that only two or three terms would constitute a satisfactory match, or he might require five or more.

PHRASES. The computer can also match the index terms with phrases in your profile. Phrases can be two to seven words in length. For example:

8

FORM 4 (Continued)



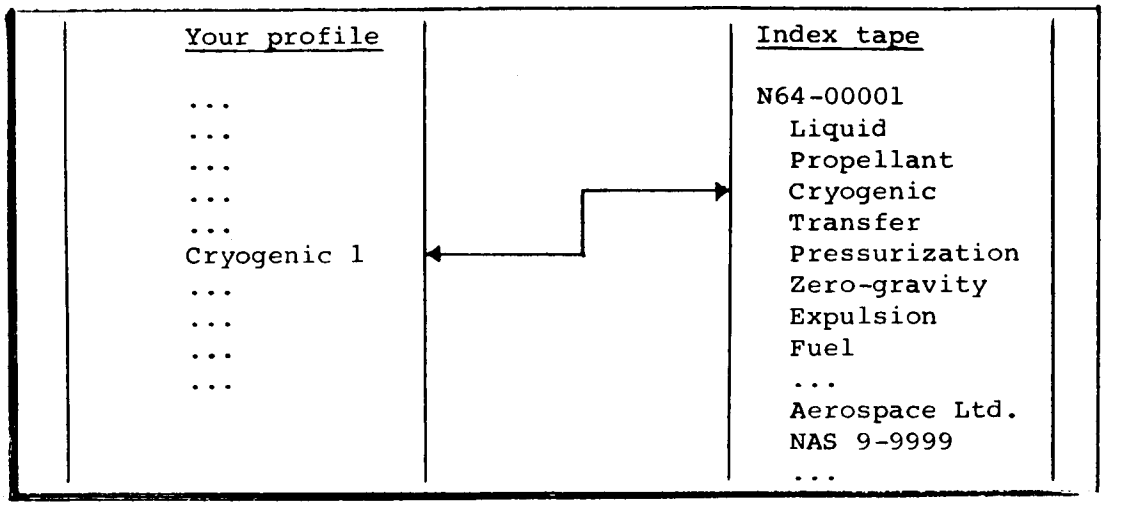
Note that the index tape has not changed; it does not contain any phrases itself, yet the computer would register a match. Each phrase is completely independent of the rest of your profile; in fact, each phrase is treated as if it were a separate profile.

In this example, if only the three terms liquid, propellant, and zero-gravity had been in your profile as independent terms, you would not have received an announcement of the report by a four-term match. It would have been a "miss." Furthermore, false combinations are much less likely with phrases than with independent terms, since any four terms can make a match, often with a non-relevant report.

"MUST" TERMS. A third way by which the computer selects an item of interest to you is to match the "must" terms in your profile. (These are the terms that you circle in preparing your original profile; they are followed by a "1" in the machine print-outs of your profile.) As shown in the following example, the machine must announce a report to you even if it finds just one of your "must" terms among those used to index a particular document:

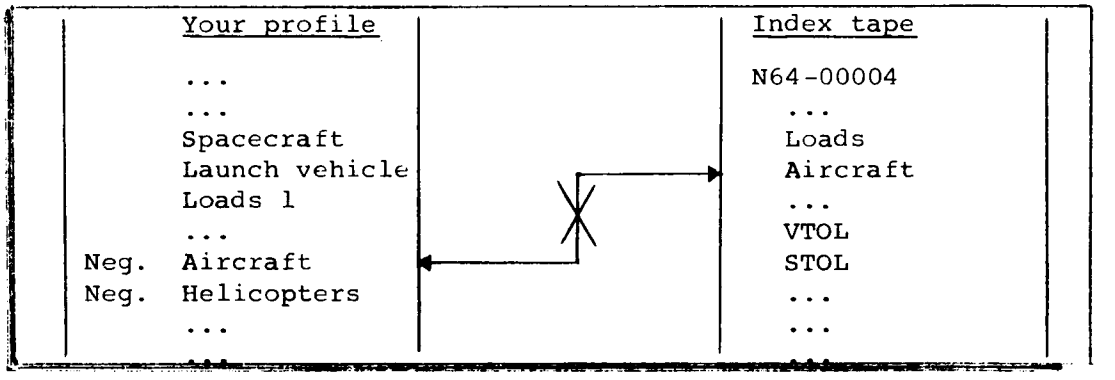
9

FORM 4 (Continued)



Contract numbers can also be indicated as must terms.

"NOT" TERMS. Expulsion of reports not of interest to you can be accomplished by writing Negative or Neg. before one or more index terms in preparing your profile. Let's take a different example, a profile indicating that you are interested in all types of loads on spacecraft, launch vehicles, satellites, etc., but not on aircraft.



Since you are interested in all types of loads, you have "musted" the term loads. You would ordinarily have received an announcement of the above report, but the negative indication has properly barred such an announcement, which would not have been of interest to you. The negative indication overrides all other instructions. You can indicate contract numbers as well as subject terms to be "not" terms.

10

The computer is able to match a series of interest profiles with a series of report indexes using all of the above types of matching techniques simultaneously. Widely different profiles, containing one, two, or all of these types of entries, and ranging from a few terms and phrases to many hundreds, are accommodated.

REFINING THE INTEREST PROFILE

An optimum profile, one that will give you what you really want in the way of report announcements, with the least amount of nonrelevant information, and without causing you to miss anything of real significance, requires that a mix of the above types of entries be judiciously selected. The following comments are intended to further help you in deciding on the terms that should be included in your interest profile and on the form in which they should be used, whether as phrases, "must" terms, "not" terms, or independent terms.

A phrase is a two-to-seven-term combination, such as, for example, "transfer of liquid propellants at zero-gravity," which is a four-term phrase. Each significant term in the phrase is matched against the report index terms. (If this phrase were in your profile, you would have received an announcement of the example report N64-00001.) Perhaps, however, you would prefer to be less specific as to gravity conditions and the nature of the propellant. You could then insert instead the two-term phrase "transfer of propellants." This phrase would assure your receipt of an announcement of the same report, as well as of others indexed to the terms transfer and propellants, regardless of what else they were indexed to. You may thus tailor your profile to receive broad coverage of a subject area or to achieve high specificity of announcements. Note that the specificity of a phrase increases as qualifying terms are added, thereby reducing the number of reports that will be announced to you, but at the same time increasing the possibility of some misses. A value judgement is therefore necessary as to the optimum length of phrases for each of your areas of interest.

Note: You will receive all announcements matched by any one of the phrases in your profile. Every phrase is a "must." Obviously, there is no point in including a three-term phrase that contains two terms that are also in a two-term phrase already in your profile. Furthermore, if a short phrase covers a broad subject, you may expect to get a large number of announcements.

For example, "heat transfer" is a two-word phrase. If it were in your profile without further qualification, you might receive 500 announcements per year from this phrase alone.

You may also refine your profile by including seemingly redundant phrases. For example, additional phrases should be written to ensure receiving announcements of reports indexed by "near-synonyms," terms such as plastics and polymers. Such terms might be assigned by the indexers to reports of similar content. Thus, if you have listed the phrase "ablation of plastics" in your profile, it would be advisable to also list "ablation of polymers." Include also specific terms, such as, in this case, polyesters, etc., which might be used rather than the more generic terms.

"MUSTS" AND "NOTS"

Inclusion of "must" terms in your profile can be beneficial if used with discretion. The possibility or receiving much extraneous material is obvious if words such as rocket or missile are circled as "musts." On the other hand, the use of carefully selected must terms can be of considerable assistance in assuring that all pertinent reports are announced, and even in reducing the number of no-interest announcements you receive. Generally the more specific the term, the greater its potential value as a must term.

Usually, whether a given term should be "musted" can easily be decided on the basis of your experience of how frequently such a term is used. In case of doubt, your library has lists of all terms currently used in indexing reports. These lists report the number of times that each term has been used, thus indicating the practicability of using it as a must term.

Don't forget that contract or grant numbers, whether NASA's or other agency's, can be "musted" to make sure that you will receive notices of all reports issued under a given contract.

The capability of excluding announcements of reports indexed to certain terms can be useful, but must be handled with care. Remember that a "not" item will stop an announcement to you of every report to which the term has been assigned in subject indexing, regardless of other terms in the report index. In the example given earlier, if the report had contained information on loads on both spacecraft and aircraft, the user interested in loads on spacecraft would not have learned of the report. This situation

will be highly unlikely, if you indicate Neg. only before terms that in your experience are not likely to occur in conjunction with those you are interested in. Again, don't forget that contract numbers can be excluded by this technique, if you already receive the reports through other channels or you are not interested for other reasons.

TERM MATCHING

All terms in your interest profile that are not "must" terms or are not part of a phrase will be matched with the report index after an attempt has been made by the computer to decide (1) whether the report should be excluded because of a "not" term, (2) whether it should be announced because of a "must" term, and (3) whether it should be announced because a phrase matches. If none of these situations apply, the computer will announce the report to you only if a large number of the independent terms--perhaps six or eight--are identical with terms in the report index. This will largely assure you against getting nonrelevant announcements, since the probability of a false combination involving so many terms is extremely low. At the same time, few announcements are likely to be made by matching on so many terms, thus emphasizing the desirability of adding well-planned phrases and must terms to your profile.

You need not cross off an independent term when you write phrases incorporating it. It will remain in your profile to take part, with other independent terms, in this limited type of matching, possibly to indicate to you an occasional interesting report whose indexing could not be matched by the rest of your profile.

WORDS TO USE

After absorbing the details of how phrases, must terms, etc., are constructed and utilized in the NASA-SDI system, you may still have the question as to what actual words you should use in making up your profile. Most of the words in your profile must be identical with the terms being used in current indexing or that might be used in ordinary language as well as technical terminology common throughout the aerospace community. So use your own words. There will be feedback from the NASA-SDI program to the indexing practitioners; thus future indexing will actually be

FORM 4 (Continued)

helped if you include words in your specialty, and also not-yet-published project names, codes, and developing technical terminology of which you are cognizant.

Nevertheless, it is recognized that reference to vocabulary listing is an excellent aid to the memory and to profile comprehensiveness. Vocabulary guides, which list cross references, codes, project names, etc., are available in your library. A more conveniently sized vocabulary guide is sent to each NASA-SDI participant. Please keep it handy and consult it in connection with your profile.

RANDOM NOTIFICATIONS

Even after refining your profile by the techniques described above, do not be surprised if you continue to receive a few announcements that seem far out of scope. These will be random notifications. Sending these to you is a method for helping you keep your profile up to date. If a random notification is of interest, and you so indicate on the response card, you will be sent a list of the terms used in indexing the report. Please consider these carefully in relation to your current profile. If some of the index terms seem appropriate to your interests, it is advisable to add them to your profile, preferably by working them into phrases. Random notifications are important in bringing your profile into conformity with index terms but should be supplemented with your own continuing review.

WHAT'S THE BEST NASA-SDI CAN DO?

With a good profile, comprehensive in coverage--but not too general--the operators of the NASA-SDI program, believe that the number of potentially useful reports missed can be reduced to an insignificant number. The system will probably never bat 1.000, but the people who run it will keep trying by improving their indexing and refining the system as you improve and refine your profile.

You can probably bat .750 or higher (eventually) in the number of hits, so that of each four report announcements you receive you'll be interested in three of them. Some announcements, of course, will always be randomly chosen just to check up on the accuracy of the system as well as to provide a means of automatically assisting you in making changes to your profile.

A LAST REMINDER

Please keep in touch with the system. Report how well or how poorly it's doing. NASA information people always stand ready to listen to your criticisms or suggestions. In this manner they can provide you and your colleagues a better service. And by all means, please report any change of address you may have.

KEYS TO PROFILE IMPROVEMENT

1. Add phrases, not too long, not too short. Rewrite independent terms into phrases. Add similar phrases using near-synonyms.

2. Add some "must" terms on topics of particular interest.

3. Consider adding "not" terms, but be sure they would not exclude reports of possible interest.

4. Add contract or grant numbers if appropriate.

5. Consult a vocabulary guide for terms used in indexing.

6. But don't hesitate also to use words in your specialty.

7. Work index terms from random notifications into your profile.

8. Call on your librarian for advice and assistance.

9. Don't hesitate to change your profile terms and phrases at any time.

15

FORM 4 (Continued)

National Aeronautics and Space Administration

Office of Scientific and Technical Information - SDI Program

Memo to:

Subject:

SUBJECT: Requested NASA SDI Profile Revision

Reference: You have recently indicated a desire to change your profile

A copy of your present profile is attached.

You may add or delete words as you wish and there is no limit to the number of words which may be submitted. Write your new profile on the form provided. If you would like advice or assistance, please feel free to 'phone or write our office.

NASA'S SDI Program
IBM - ASDD
2651 Strang Blvd.
Yorktown Heights
PEekskill 7-6600, Ext. 669

FORM 5. Profile revision cover letter. Any user could at any time request a copy of his profile, which was sent to him with this letter.

IBM

Advanced Systems Development Division
2651 Strang Blvd.
Yorktown Heights, New York

International Business Machines Corporation

Telephone. PEekskill 7-6600

Dear SDI Participant:

Attached are two copies of your interest profile as it is presently being utilized in the SDI program. Please retain one copy for your own records and return the second copy, with any changes, to your library as soon as possible.

Since your profile is one of the most critical variables in determining the usefulness of our program, we ask that in reviewing it, you:

a. Utilize phrases wherever applicable, preferably no more than four words in length.

b. Eliminate any non-descriptive words which are not part of a phrase, e.g., system, device, technique, etc.

c. Include synonyms wherever applicable.

d. Indicate any "musts" (the most important words in your profile) by placing a one (1) after the words.

As a reminder, you need not wait until you are sent future copies of your profile to indicate changes. You may write our office directly, or contact your library, or punch out the comment box on any of our notification cards and write in your changes.

If you have any further questions or comments, please contact either your local librarian or our office.

NASA'S SDI Program
IBM - ASDD
2651 Strang Boulevard
Yorktown Heights, N.Y.

PEekskill 7-6600, Ext. 669

FORM 6. Profile mailing cover letter. This letter was forwarded to users with copies of their profiles in the three formal profile mailings.

IBM
Advanced Systems Development Division
2651 Strang Boulevard
Yorktown Heights, New York

International Business Machines Corporation

Memorandum to:

Subject: NASA - SDI Program

We have recently reviewed the responses you have been making to the abstract notifications we have been disseminating to you as part of this program. Our records indicate that you have not responded to approximately % of our notifications.

Since this is a developmental program, we wish to fully evaluate its effectiveness. Therefore, we would appreciate your cooperation in responding to each notification we furnish you.

If for some reason you are finding it difficult to comply with this request, please contact your Center Librarian or our office directly.

A. Resnick
SDI Manager
NASA - SDI Program

FORM 7. Letter reminding users to return responses to the system, to further effectiveness evaluation.

Memo To:

Subject: Your comment on NASA'S SDI Document Notification #_____.

The reason the document notification in question was not relevant to your interests was that it was sent to you at random.

The system distributes these random notifications to (1) obtain a statistical estimate of the miss incurred by the system and (2) to determine the manner in which individual profiles should be modified.

These random notices are an integral part of NASA'S SDI Program. It is hoped that they do not cause you any inconvenience. Ultimately they will be to your benefit in that they will allow the Program to focus more precisely on your interests.

NASA'S SDI Program
IBM - ASDD
2651 Strang Blvd.
Yorktown Heights, N.Y.

104

FORM 8. Memo explaining to user that the irrelevant notice he had commented on was a random notice.

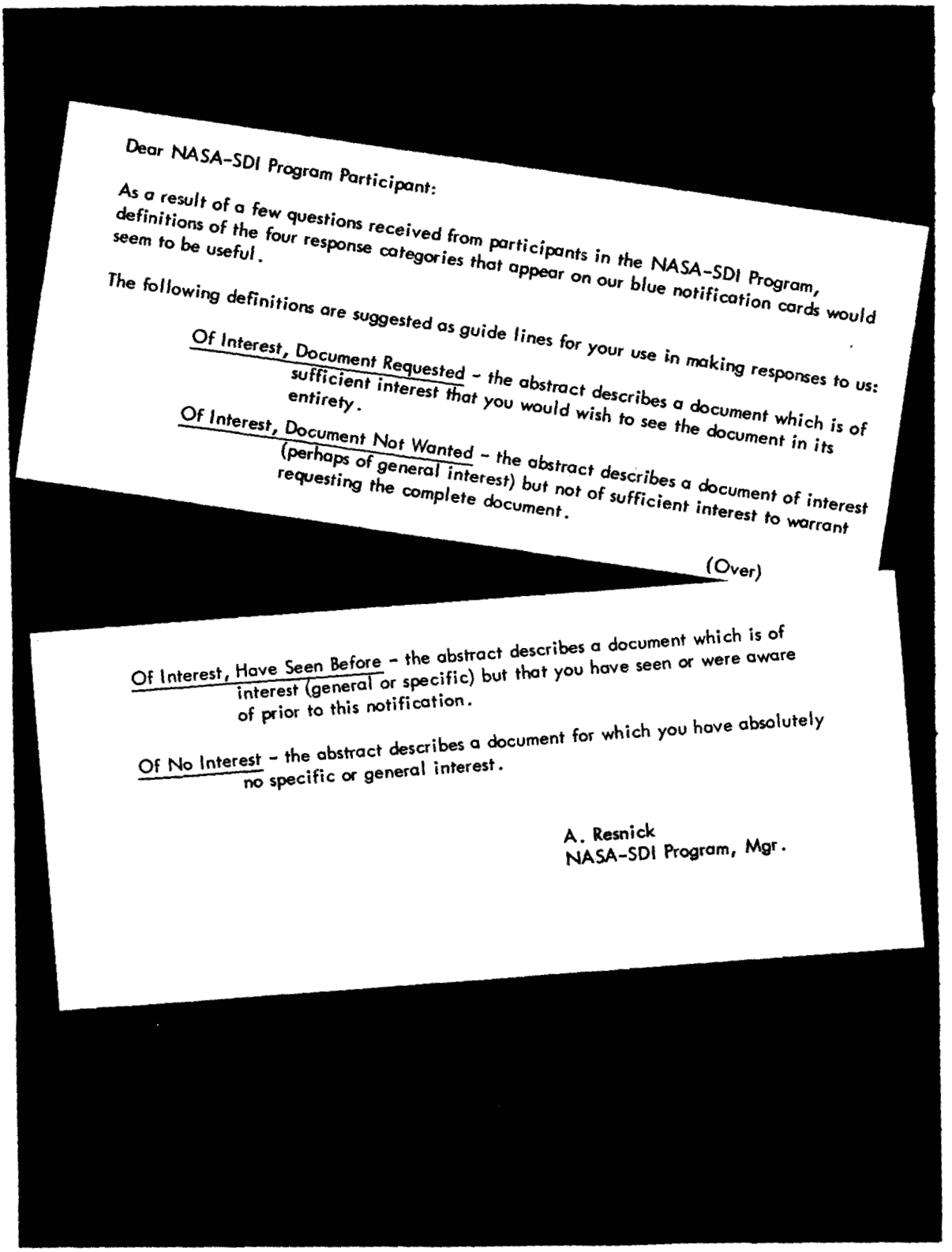
Memo to:

Subject: Change in your NASA-SDI Profile

You recently rated one of our random notices as being relevant to your interests. The words that were used to describe the document were:

If you would like any of these words added to your profile, please encircle them (utilizing phrases whenever possible) and return this card to the address on the reverse side by using one of our notification envelopes.

FORM 9. Memo listing for user the document profile of a random notice that he rated as relevant, suggesting that he may want to add words from that profile to his own profile.



Dear NASA-SDI Program Participant:

As a result of a few questions received from participants in the NASA-SDI Program, definitions of the four response categories that appear on our blue notification cards would seem to be useful.

The following definitions are suggested as guide lines for your use in making responses to us:

Of Interest, Document Requested - the abstract describes a document which is of sufficient interest that you would wish to see the document in its entirety.

Of Interest, Document Not Wanted - the abstract describes a document of interest (perhaps of general interest) but not of sufficient interest to warrant requesting the complete document.

(Over)

Of Interest, Have Seen Before - the abstract describes a document which is of interest (general or specific) but that you have seen or were aware of prior to this notification.

Of No Interest - the abstract describes a document for which you have absolutely no specific or general interest.

A. Resnick
NASA-SDI Program, Mgr.

FORM 10. Memo describing to user the meaning of the document response categories.

IBM

Advanced Systems Development Division
2651 Strang Blvd.
Yorktown Heights, New York

International Business Machines Corporation

Telephone: PEekskill 7-6600

Dear SDI Participant:

Over the past several months you have had the opportunity to participate in our SDI Program. On or about September 1, 1964, IBM will have completed its experimental effort in this project. After that date NASA's Documentation Facility in Bethesda, Maryland will assume all responsibility for the continuation of this program. Further information regarding this transition will be available from your local librarian or designated SDI representative. IBM has welcomed this opportunity to serve you and sincerely appreciates the extensive cooperation on your part which made this undertaking possible.

Since the portion of this program we are about to complete was experimental in nature, we would be grateful for a final effort on your part to assist us in evaluating the effectiveness of SDI as a means of communicating technical information.

Attached is a brief, self-addressed questionnaire which, upon completion, should be stapled and returned to your local library. If you wish, you need not sign your name, as the results are to be used in aggregate with those of other respondents. We would welcome your most candid comments since these may be extremely useful in any future considerations regarding this program.

We would appreciate return of this questionnaire at your earliest convenience. Thank you for your continued cooperation.

A. Resnick
A. Resnick
SDI Program, Mgr.

AR:mph

Attach.

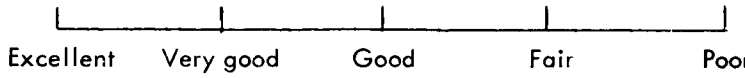
FORM 11. User questionnaire and cover letter. This questionnaire and cover letter were submitted to all NASA-AF -SDI users towards the end of the operational period at IBM.

NASA-SDI PROGRAM QUESTIONNAIRE

Please answer each applicable question, adding any comments that you desire.

If you require additional space, please use the back of any sheet or additional paper.

I. Place a check at that point on the scale from excellent to poor at which you would rate the NASA-SDI Program.



If you answered between fair and poor, please indicate why.

II. Has the NASA-SDI Program helped you to keep informed in your professional area?

YES____ NO____

If so, has this knowledge contributed to your work effort?

YES____ NO____

If yes, please elaborate indicating any specific instances, if applicable.

III. Indicate your reaction to the number of abstracts you have been receiving.

a. Receiving too many
b. Receiving an appropriate amount
c. Receiving too few

FORM 11 (Continued)

IV. Do you retain SDI abstracts of documents in which you are interested for your file:

YES____ NO____

If yes, what percentage?

Please approximate the number you have retained (about 100 per inch).

V. Have the abstracts themselves been of any value to you other than to assist you in deciding whether or not to order a document?

YES____ NO____

If yes, please indicate what use you have made of the abstracts.

VI. Had you consulted Scientific and Technical Aerospace Reports (STAR) prior to the introduction of the NASA-SDI Program?

YES____ NO____

If yes, are you still using STAR?

YES____ NO____

VII. Have you, as a result of having had exposure to SDI, begun using STAR?

YES____ NO____

VIII. Is the speed at which you are receiving the NASA-SDI notifications adequate?

YES____ NO____

FORM 11 (Continued)

IX. Is the information being furnished to you by SDI generally current?

YES____ NO____

If no, were you aware of it by some other source(s)?

YES____ NO____

If by some other source(s), please indicate which source(s).

X. Did you receive documents requested as a result of SDI announcements within a reasonable period of time?

YES____ NO____

What is your estimate of the average time required for transmittal of the document to you?

a. 1 day
b. 2-3 days
c. 1 week
d. 2 weeks
e. Longer (indicate how long)

What time period would be most satisfactory for you?

XI. Do you use microfiche:

a. Regularly
b. Occasionally
c. Not at all
d. I am not familiar with it

Assuming that adequate reader equipment were available, would you consider prompt filling of a document request by microfiche preferable to waiting for full size reproduction?

YES____ NO____

XII. Have you made any other uses of information received through the NASA-SDI Program e.g., new contacts or new sources of information?

YES____ NO____

FORM 11 (Continued)

If so, please explain.

XIII. Did others make use of any of the information you obtain from SDI?

YES_____ NO_____

If yes, in what way?

XIV. Have you ever ordered a document from SDI for someone else?

YES_____ NO_____

Did you pass on abstracts or documents to others for their information?

YES_____ NO_____

XV. Do you think that information which has already been furnished to you by SDI will prove useful to you in the future.

YES_____ NO_____

Comments:

FORM 11 (Continued)

XVI. Please list below any features which you would like to see added to or deleted from the NASA-SDI Program.

If you have any additional comments, please write them below.

PLEASE BE SURE TO FOLD AND STAPLE THIS QUESTIONNAIRE SO THAT THE LIBRARY'S RETURN ADDRESS IS CLEARLY VISIBLE.

THANK YOU FOR YOUR COOPERATION.

FORM 11 (Continued)