Selective Information Announcement Systems for a Large Community of Users*

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Selective dissemination of information (SDI) has been developed within NASA as a current awareness service and is successfully employed both centrally and decentrally. However, recognition has been given by NASA and others to the potential advantages of automatically generating selected announcements by techniques more economical than individual SDI profile matching. Such a technique, NASA SCAN, is at present a developmental information program, not fully available to all potential users. Current participation by representative NASA research centers and contractors is providing a basis for projecting a fully operational system. Information is accumulating on such factors as processing methods, distribution techniques, user response, cost elements, and document request fulfillment. Continued development of SCAN should lead to an effective, flexible, and economical current awareness service for large numbers of users. SCAN is an acronym for Selected Current Aerospace Notices.

A significant change of direction and emphasis is taking place today in information science and technology. A few years ago, we heard much talk of the "information explosion," with emphasis on the problems of coping with the multiplication of reports, journals, books, and documents of all types. The principal problem was considered to be retrieving these documents, simply as documents, in passive response to requests initiated by potential users. Although these problems are still significant, partial solutions have been found through microreproduction and computer processing. Today, in contrast, we are more concerned with taking the initiative, in assuring that information reaches the potential users and is effectively utilized. Information topics of prime interest today are:

1. repackaging information for a variety of user audiences;
2. providing data referencing tools;
3. making *information*, in contrast to documents, available to users;
4. providing concise reviews of large volumes of related work;
5. placing the user more directly in contact with computer-stored information, as in direct access, console display systems;
6. bringing person-to-person relations into more precise definition and utility in information communication;
7. automatically calling the attention of individuals in large user communities to documents of specific interest, as in the technique commonly known as selective dissemination of information (SDI).

These objectives generate most of today's efforts to improve technical communication. The last item on this list, automatic current awareness, continues to be studied and developed along new lines, even though the earliest tests were begun nearly 10 years ago (*1*).

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BACKGROUND

The National Aeronautics and Space Administration, in compliance with its legislative authorization to publish and disseminate the results of NASA research activities and findings, provides a broad spectrum of scientific and technical information services. A broad NASA developmental program emphasizes decentralization and places the principal system interface as near as possible to the individual user. Insofar as possible, all reference tools, indexes, publications, computer search capabilities, and current awareness services are decentralized to permit swift and direct communications between the user and the information store.

NASA meets one set of users' information needs by printing and distributing the formal report series: Technical Reports, Technical Notes, Technical Memoranda, Technical Translations, and NASA Contractor Reports. Another series called Special Publications includes monographs, state-of-the-art summaries, conference proceedings, reviews, photo-atlases, and bibliographies. In addition to these NASA-supported documents, the NASA system includes reports from world-wide sources: U. S. and foreign government agencies, industrial firms, research institutions, and academic laboratories. The computer-processed collection consists of over 300,000 documents and is growing at the rate of over 100,000 items a year. Accessibility of this document store is an essential key to the full utility of the NASA information system. A central processing facility prepares and distributes microcopies for most of these documents. The copies are distributed as diazo transparencies in sheet form; thus, microfiche helps to achieve the desired decentralization.

Another local user need is met by announcing current report literature in the abstract journal *Scientific and Technical Aerospace Reports* (*STAR*) and, by agreement with

the American Institute of Aeronautics and Astronautics, announcing aerospace information appearing in journals, books, and conferences in the abstract journal *International Aerospace Abstracts* (*IAA*).

Abstract journals such as *STAR* and *IAA* are used by a broad audience, providing a capability for a highly personalized literature search and allowing the user to make quick searches at his desk. They provide this searching capability to a majority of the NASA community of users, those who do not have ready access to means for conducting computer searches.

NASA meets the searching needs for organizations possessing appropriate computer resources by distributing magnetic tape containing bibliographic and retrieval information. Each month, tapes containing index terms and full citations of all documents announced in the corresponding issues of *STAR* and *IAA* are distributed to NASA laboratories and major NASA contractors. A number of tape recipients also have programs for current awareness service (SDI).

CURRENT AWARENESS

Through their subject categories and printed indexes, abstract journals have an advantage over most mechanized current awareness systems in that they permit the ultimate user to scan and browse any or all of the document representations: titles, bibliographic entries, abstracts, and index entries. However, experience has shown that abstract journals usually provide too large a volume of information to be fully satisfactory tools for satisfying the current awareness needs of busy scientists and engineers. In the aerospace field, an average semimonthly issue of *STAR* contains over 1200 abstracts, and *IAA*, which is distributed semimonthly on alternate weeks with *STAR*, contains a similar volume. The recipient does not, or thinks he does not, have the time to delve into this bulk of information. Clearly, a complete spectrum of information service demands a method for calling needed documents quickly and easily to each user's attention—giving him nuggets of information from a mountain of literature. Thus grew a variety of automated selective information announcement systems.

NASA SDI. NASA, in the period since 1963, has operated an evolutionary SDI program combining the promptness of abstract journal announcement with selectivity of individual literature searches (*2, 3*). In this program, the user specifies the subjects of interest to him in whatever degree of specificity he desires. From his specification, usually in natural language phrases, a reference analyst constructs an "interest profile" in the vocabulary of the indexing system. The user is consulted in this initial effort and can contribute effectively to structuring his profile; experience has demonstrated the impracticality of user's preparing their own interest profiles without aid from a reference analyst. The user interest profile thus conforms as closely as possible to the same subject authority list used in indexing every document in the NASA collection. Profile terms are processed by the same logic used in retrospective searches (*4*). As the computer compares each SDI participant's profile with the terms assigned to the documents in the current *STAR* or *IAA*, it identifies matches. A different print-control computer then prepares a bibliographic listing of the matched documents for mailing to the user.

The NASA SDI program has passed through two principal developmental stages. The initial phase was conducted by IBM's Advanced Systems Development Division under contract to NASA during the period November 1963 to August 1964. Participants received, for each selected announcement, a card on which the full abstract had been offset printed, plus a separate response card on which the user could evaluate the relevance of the announcement and order the full document if desired. The system required an IBM 7090 or 7094 computer with 32K storage, two IBM 7607 data channels, and at least eight IBM 729 tape drives. The document vocabulary control and match programs ran under modified versions of the FORTRAN II Monitor System. With some modification, this same program was continued in operation until February 1966, by the NASA Scientific and Technical Information Facility operated by Documentation Inc. Experience with the program and essentially complete documentation has been presented (*2, 3, 5, 6*).

Operation of the 7090-based system was discontinued in February 1966, primarily because of computer availability factors. An IBM 1410 computer was more available than 7090/94, and its subsequent replacement by an IBM System 360/40 allowed continued processing of only 1410 programs. SDI service continued with changes in both the computer processing and the form of announcement. NASA SDI participants currently receive selected notifications in the form of computer-printed listings on three-part no-carbon 8½ × 11 inch paper. The user can check preprinted blocks to indicate that an announcement is "of interest," is of interest with "document requested," or of "no interest." The user retains the original and sends the correspondingly marked copies to his local library where one is used for filling document requests and the other is returned for response evaluation. Responses are tabulated and relevance percentages calculated for each journal user, issue, and organization served. Average relevance of announced documents exceeds 70%.

The SDI notifications provide bibliographic citations plus all the subject index terms assigned to each document. Document abstracts are not provided in these SDI lists, but are referenced for ready lookup in *STAR* and *IAA* issues.

Selection of each announcement made is done through computer matching of the subject index terms assigned to each document with the terms in each user's profile. The latter consists of groups containing weighted terms to which positive or negative weights are assigned; each group is assigned a required minimum weight for a match to occur and a user notification to result. Except for minor changes to facilitate computer processing of large numbers of profiles, the program is identical with the bibliographic search program described previously (*4*). It requires as minimum computer configuration an IBM 1410 computer with process overlap and priority features, 40K memory, a 1402 or 1442 card reader, a 1403 printer, and five tape drives. The program was written in Autocoder by Documentation Inc.

The NASA SDI program currently serves a large community of users, providing announcements of aerospace

reports and journal literature to approximately 650 NASA engineers and scientists at 12 locations and to 200 U.S. Air Force employees at 11 locations. In addition, one NASA center operates an SDI service with local computer matching of over 100 profiles based upon the NASA tape distribution and employing the same indexing system with a similar type of SDI announcement.

The central NASA SDI system currently requires approximately six hours of IBM 360/40 time to match 850 interest profiles against 1200 document profiles, plus about nine hours of IBM 1401 time to print the output. The average user receives about 18 announcements for each *STAR* or *IAA* issue, or about 1.5% of the document input. Expenses incurred in operating the system are almost linear—that is, nearly proportional to the number of users participating—regardless of whether the computer matching is performed centrally or locally. Because NASA is concerned with developing selective dissemination service for a much larger community of aerospace-interested users, new approaches have been sought.

ORGANIZATIONAL PROFILES

One response to the problem has been the profile related to the specific interests of a laboratory section, branch, or other organizational unit. Interest profiles of this type are also called *functional* profiles, as they are derived from the functional information needs of working groups. Fewer profiles are required than in an individually oriented SDI system; computer usage and total cost are lower; and the considerable effort involved in SDI user turnover is reduced. To keep the system highly flexible in meeting current awareness needs, supplemental SDI profiles can be provided for specific or temporary topics of interest. As these should be short, the cost would be small. The organizational profile technique appears particularly appropriate for a compact research center oriented toward specific research or developmental objectives.

SCAN SYSTEM

In considering large-scale systems, one must take many factors into account. Computer usage generally increases proportionately with the number of profiles to be matched against the document input, as does computer printing time. Even more serious is the requirement for skilled reference analysts or complex computer routines to evaluate and improve profiles, of both individual and organizational types. NASA experience has shown that one profile reviewer cannot adequately care for more than about 250 individual SDI profiles, at least in an environment of changing technology and high individual turnover. Hence the system designer is led to a system (or subsystem of an over-all current awareness activity) with the following characteristics:

1. Profiles related to subject topics, rather than to individual or organizational interests.
2. Specific interests approximated by having users receive announcements selected under one or several topics.
3. Low-cost reproduction of computer printout of each topic's announcement list.
4. Dissemination of lists to local organizations in batches permitting local control of shifting individual interests.
5. Optimization of the number and designation of topics for:
   (a) subject content of the document input;
   (b) suitable flexibility to meet expressed needs of the users and cover subjects of particular aerospace interest;
   (c) number of documents announced by the average topic;
   (d) average number of topics matched to each document and proper subject overlap.

NASA SCAN Program. A current awareness system with these characteristics is now under development by NASA. The program is called SCAN (Selected Current Aerospace Notices) and provides listings of both reports and journal literature. [The SCAN acronym has also been used by IBM for a current awareness service (*7*).] Elements of the system are being tested with a limited number of organizations (NASA centers and contractors) to project the characteristics of an expanded, fully operational system.

A typical SCAN announcement listing is shown in Figure 1. The items listed are selected by the same computer program used for NASA SDI selections, but output format is quite different. The 12 announced documents were selected on the subject of "Welding" from among the 1100 items announced in a single issue of *STAR*. The number preceding the title "Welding" is the number of the SCAN topic in the current catalog of SCAN topics. This printout adapts to the need for duplicating large numbers of copies from computer printout. So that only very few second (or trailer) sheets will be required to accommodate each topic announcement list, a double-columned format is reduced to 55% of initial size during the preparation of offset master plates. Further, to facilitate the ultimate user's scanning speed for the listings he receives, the computer output device places the title conspicuously at the beginning of each item and restrikes them for a boldface effect. Special processing of this type is feasible with SCAN as only a single printout is made. As do the SDI announcements, SCAN announcements include index terms for their added information content.

SCAN notification listings are offset printed, collated according to the expressed requirements of the participating organizations, and mailed in batches. The copies are received by a designated central service point at the user's organization, usually the library, which maintains the copy requirement of the individual user and routes the appropriate copies to him.

Distribution is scheduled closely with the distribution of the corresponding current copies of *STAR* and *IAA*. The user may request a full-text copy of an announced document by checking the appropriate item, writing his name and mail code on blank lines provided, and forwarding the notification sheet to his local library. Unlike SDI, the user need not indicate his interest or lack of interest in every item, and the library does not have the responsibility of separating response sheets and returning them to the SDI system operator.

SCAN topics can be created to meet the needs of various users. For example, a NASA engineer may select SCAN announcements on such topics as Titanium, Vacuum Technology, or Spacecraft Stresses and Loads. A scientist may select announcements on Solar Astronomy or Terrestrial Magnetism. Topics such as Management and Information

NASA/SCAN Notification

Order the documents you want by checking the appropriate boxes. Then write your name and internal mail code in the spaces below, and forward the entire sheet to your library.

NAME _____ MAIL CODE _____

15-0006 WELDING
STAR ISSUE #02, 23 JANUARY 1967

☐ ULTRASONIC WELDING PROCESS AND EQUIPMENT FOR CONSTRUCTION OF ELECTRON-TUBE MOUNTS AEROPROJECTS, INC., WEST CHESTER, PA. THOMAS, J. G. JUN. 1966 68 P AD-639212
CAPABILITY, ELECTRON, *ELECTRON TUBE, ELECTRONICS, FAILURE, *MANUFACTURING, MOUNT, PROCESS, TEST, TOOLING, TUBE, ULTRASONIC, *ULTRASONIC WELDING, WELDING C15 N67-11270 #

☐ A STUDY OF EMBEDMENT AND OTHER METALLURGICAL AND MECHANICAL CHARACTERISTICS OF CROSS-WIRE RESISTANCE WELDS NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, GODDARD SPACE FLIGHT CENTER, GREENBELT, MD. MURFORD, J. A. WASHINGTON, NASA, NOV. 1966 27 P REFS NASA-TN-D-3714
AEROSPACE, CROSS, ELECTRODE, ELECTRONIC, *ELECTRONIC EQUIPMENT, EMBEDDING, EQUIPMENT, FORCE, FUSION, JOINT, METALLURGY, NICKEL, *RESISTANCE, SHEAR, STRENGTH, TORSION, *WELDED JOINT, WELDING, WIRE C15 N67-11327*#

☐ DEVELOPMENT AND BUILD OF PROTOTYPE TOOLS FOR INDUCTION BRAZING OF STAINLESS STEEL TUBING AND FITTINGS FOR NASA APPLICATIONS FINAL REPORT GENERAL ELECTRIC CO., CINCINNATI, OHIO. GREISL, D. H. MAR. 1966 106 P NASA-CR-79752 R66FPD47
*BRAZING, COUPLING, ELBOW, *FITTING, FLUID, INDUCTION, LEAKAGE, MANUFACTURING, PROPULSION, ROCKET, SIZING, STAINLESS, STEEL, *TOOL, *TUBING C15 N67-11687*#

☐ TITANIUM AND ITS ALLOYS. PUBLICATION NO. 10 - INVESTIGATION OF TITANIUM ALLOYS ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS, LTD., JERUSALEM. KORNILOV, I. I. 1966 444 P REFS TRANSL. INTO ENGLISH OF THE PUBL. **TITAN I EGO SPLAVY. ISSLEDOVANIYA TITANOVYKH SPLAVOV** MOSCOW, IZD. AN SSSR, 1963 PAPERS PRESENTED AT THE 2D CONF. ON THE THEORET. AND EXPTL. INVEST. OF TITANIUM ALLOYS, MOSCOW, MAR. 1962 PUBLISHED FOR NASA AND NSF NASA-TT-F-362 TT-65-50139
ALLOY, CHEMICAL, *CHEMICAL REACTION, COMPOSITION, *CONFERENCE, CORROSION, *CORROSION RESISTANCE, CRACK, CREEP, DIAGRAM, DILATOMETER, ELASTICITY, ELECTROCHEMISTRY, EMBRITTLEMENT, EQUILIBRIUM, FORMATION, GAS, HEAT, HYDROGEN, KINETICS, MECHANICAL, *MECHANICAL PROPERTY, METAL, MICROSTRUCTURE, OXIDATION, PHASE, PROPERTY, REACTION, RESISTANCE, STRENGTH, STRUCTURE, THERMOSTABILITY, *TITANIUM, TRANSFORMATION, TREATMENT, WELDING C17 N67-11761*#

☐ THE INFLUENCE OF HYDROGEN ON THE TENDENCY OF TITANIUM ALLOYS TO DELAYED CRACKING ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS, LTD., JERUSALEM. KRYLOV, B. S. MIKHAILOV, A. S. IN ITS TITANIUM AND ITS ALLOYS 1966 P 151-157 REFS /SEE N67-11761 02-17/ CFSTI- HC $7.00/MF $2.00
ALLOY, BENDING, CONFERENCE, CRACK, *CRACK FORMATION, DELAY, EFFECT, FORMATION, HEAT, *HYDROGEN, JOINT, LOAD, STRESS, TITANIUM, *TITANIUM ALLOY, TREATMENT, WELDING C17 N67-11779*#

☐ PHASE TRANSFORMATIONS IN THE HEAT-AFFECTED ZONE OF ALPHA-TITANIUM AND ALPHA PLUS BETA- TITANIUM ALLOYS AND THE CRITERIA FOR CHOOSING THE WELDING PROCESS ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS, LTD., JERUSALEM. NAZAROV, G. V. SHORSHOROV, M. KH. IN ITS TITANIUM AND ITS ALLOYS 1966 P 297-302 REFS /SEE N67-11761 02-17/ CFSTI- HC $7.00/MF $2.00
ALLOY, COMPOSITION, CONFERENCE, COOLING, CYCLE, FORMATION, HEAT, HYDRIDE, PHASE, *PHASE TRANSFORMATION, THERMAL, TITANIUM, *TITANIUM ALLOY, TRANSFORMATION, *WELDING, ZONE C17 N67-11798*#

☐ THE MECHANISM OF DELAYED FAILURE AND THE FORMATION OF COLD CRACKS DURING WELDING OF TITANIUM ALLOYS AND OF STEELS ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS, LTD., JERUSALEM. BELOV, V. V. NAZAROV, G. V. SHORSHOROV, M. KH. IN ITS TITANIUM AND ITS ALLOYS 1966 P 303-311 REFS /SEE N67-11761 02-17/ CFSTI- HC $7.00/MF $2.00
ALLOY, BOUNDARY, BRITTLENESS, COLD, CONFERENCE, CRACK, *CRACK FORMATION, DELAY, *FAILURE, FORMATION, GRAIN, MECHANISM, *STEEL, TITANIUM, *TITANIUM ALLOY, VACANCY, *WELDING C17 N67-11799*#

☐ SOLDERING AND BRAZING OF AT-3 TITANIUM ALLOYS COATED WITH DIFFERENT ELECTRODEPOSITS ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS, LTD., JERUSALEM. BONDAREV, V. V. SHINYAEV, A. YA. IN ITS TITANIUM AND ITS ALLOYS 1966 P 339-343 REFS /SEE N67-11761 02-17/ CFSTI- HC $7.00/MF $2.00
ALLOY, COATING, CONFERENCE, DIFFUSION, ELECTRODEPOSITION, JOINT, OXIDATION, PROTECTION, *PROTECTIVE COATING, *RHENIUM, *RHODIUM, *SILVER, *SOLDERING, STRENGTH, TENSION, TITANIUM, *TITANIUM ALLOY, ZONE C15 N67-11803*#

☐ PRODUCTION ENGINEERING MEASURE FOR SILICON OVERLAY TRANSISTORS QUARTERLY PROGRESS REPORT, 1 JAN. - 31 MAR. 1966 MOTOROLA, INC., PHOENIX, ARIZ. CASSIDY, M. GREER, P. APR. 1966 45 P QPR-5 AD-635118
BOND, DIFFUSION, ELECTRONICS, ENGINEERING, FAILURE, MANUFACTURING, METHOD, OVERLAY, PRODUCTION, *PRODUCTION ENGINEERING, RELIABILITY, SILICON, *SILICON TRANSISTOR, SPECIFICATION, STORAGE, TRANSISTOR, ULTRASONIC, WELDING C09 N67-11894 #

☐ SATURN V, S-IC Y-RING ELECTRON BEAM WELDING SYSTEM NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA. BRENNECKE, M. W. HOPPES, R. V. STANTON, W. P. 30 MAR. 1965 89 P REFS NASA-TM-X-57109 R-ME-IN-65-4
BEAM, CHARGER, ELECTRON, *ELECTRON BEAM WELDING, ELECTRONIC, JOINING, RING, *SATURN S- IC STAGE, SEGMENT, SYSTEM, TOOLING, VACUUM, WELDING C15 N67-11963*#

☐ MANUFACTURING ENGINEERING LABORATORY*S WELD ENVIRONMENTAL CONTROL NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA. DALEY, D. M. JAN. 1964 11 P PRESENTED TO THE 1ST S-IV, S-IV-B MEWGM, 15-16 JAN. 1964 NASA-TM-X-59978
ATMOSPHERIC, BULKHEAD, CONTROL, DIRT, ENGINEERING, ENVIRONMENT, *ENVIRONMENTAL CONTROL, FABRICATION, HUMIDITY, OPTIMIZATION, SATURN, *SATURN S- IC STAGE, SPACE, STRUCTURAL, *STRUCTURAL ENGINEERING, TEMPERATURE, VEHICLE, WELDING, WIND C15 N67-12231*#

☐ BRAZING AND BRAZING ALLOYS - A BIBLIOGRAPHY NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C. 1966 59 P REFS NASA-SP-5026
AEROSPACE, *ALLOY, *BIBLIOGRAPHY, *BRAZING, EVALUATION, FABRICATION, HIGH TEMPERATURE, *INDUSTRY, LOW TEMPERATURE, REFRACTORY, TECHNOLOGY, TESTING, WELDING C15 N67-12279*#

PAGE 1

Figure 1. Selective printout of references on welding.

Technology meet other needs. Several hundred topics are being tested as suitable SCAN topics for an initial system, with experience leading to additional subjects, perhaps more complex in concept. Whatever their scope, SCAN topics possess highly flexible and responsive relationships to both user requirements and document input characteristics. In these two aspects, at least, they are superior to any category or classification schemes that might be devised for a similar purpose.

Optimum SCAN System. When employed in a given discipline or mission environment, a complete set of SCAN topics may be characterized by two principal variables:

(a) Selectivity, increasing with the number of SCAN topics in the set.
(b) Size of average announcement list, increasing with potential of each topic for matching input documents.

As illustrated in Figure 2, these two variables produce a family of curves depending upon the degree of overlap between topics in the set. As the number of topics is increased by the system operators, the degree of selectivity presented to each user heightens. For a given size of announcement list—*i.e.*, number of documents in the average list—the amount of overlap built into the construction of SCAN topics controls the number of different topics in which a given document is announced. Thus, the typical SCAN topic, as illustrated in Figure 1, contains 12 items when processed against approximately 1000 input documents. If a system is operating with a 300-topic SCAN catalog, the average document will be announced in between three and four different topic lists. The optimum system must be built around these elements, the most favorable number of topics in the system being combined with a suitable degree of subject overlap between topics.

Looking at recent NASA experience with both SDI and SCAN users, one can begin to arrive at the optimum system. As indicated above, the NASA environment of aerospace documents and users has resulted in an individualized SDI system that gives each user an average

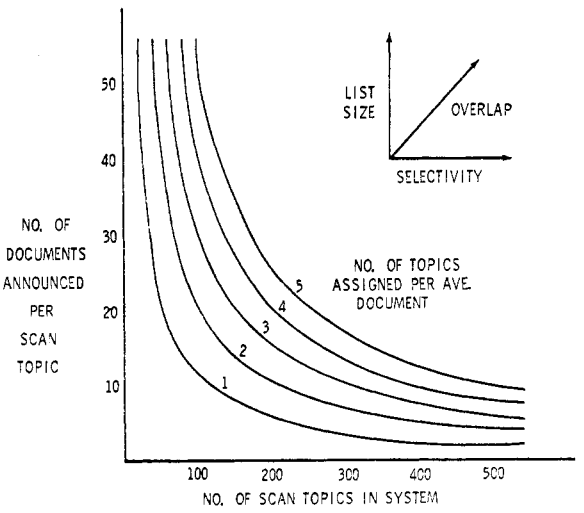

Figure 2. Variation of SCAN list size with the total number of SCAN topics and their degree of overlap for 1000 documents screened.

of 15 document notifications for each 1000 documents processed. This figure reflects a leveling off after a profile adjustment period of over a year, and hence may be considered a valid reference point for SCAN comparison. With consideration given to a probably lower relevance or precision ratio in SCAN than the 70% SDI relevance ratio experienced at this level of announcement, the total number of documents announced to each user in a SCAN system will be higher than in the SDI system. Assuming that an adequate recall level has been attained by the average NASA SDI user, the SCAN user should receive more than one appropriately selected SCAN topic. The exact number to be considered optimum will depend upon the total number of topics and their degree of overlap.

Current NASA developmental efforts toward system optimization are directed to user acceptance tests and development of cost factors.

COST FACTORS

Cost factors can be divided into two classes: incremental cost elements and system control variables. Assuming a stabilized environment, including subject vocabulary and announcement generation technique, the principal system variables remaining are:

T Total number of topics.
U Total number of users.
N Average number of topics received by a user.
L Average number of documents announced through a topic per 1000 documents processed.

Principal incremental cost elements are:

1. Profile preparation and maintenance (with user cooperation and feedback processing).
2. Document matching (computer processing).
3. Printout (computer processing).
4. Duplication and sorting (preparation of packages for mailing).
5. Distribution (mailing and handling at user location).
6. User reviewing (reading and decision time).

All the foregoing cost factors can be related to each other for SCAN and SDI systems similar to those described here. The following data show incremental cost elements followed by each system variable factor (or factor product) to which it is directly related by an appropriate unit cost:

Incremental Cost Element	SDI	SCAN
Profile maintenance	U	T
Document matching	U	T
Printout	LU	LT
Duplication, collation		NU
Distribution	U	U
User reviewing	LU	LNU

OPERATING RANGES

Figure 3 illustrates the working ranges for typical SDI and SCAN systems in a mission-oriented, interdisciplinary environment such as NASA's. The figures are given on an annual basis, and the operating lines are for

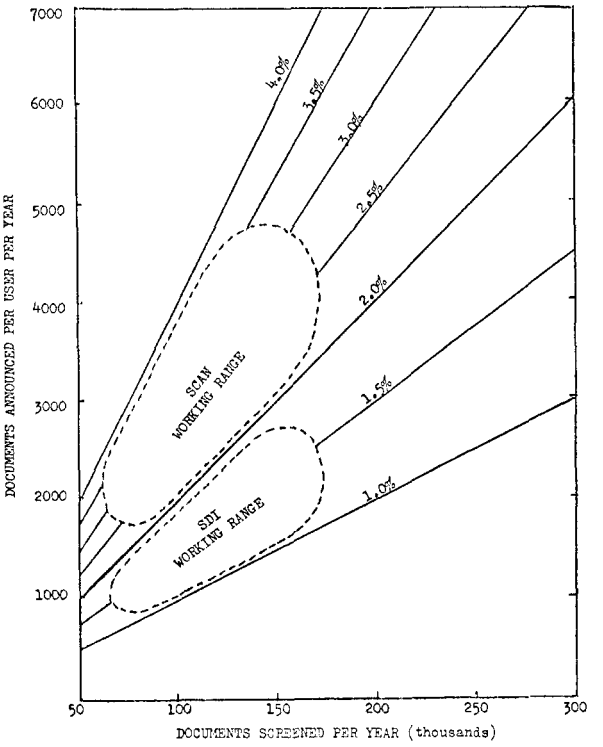

Figure 3. Working ranges of SCAN and SDI

unchanging ratios of the number of document announcements received by an average user to the number of documents introduced. Where the annual document input exceeds the 150,000 range, there are indications that initial screening or separation of input can be performed advantageously by techniques other than those described here.

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ISI's Experiences with ASCA—A Selective Dissemination System*

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ASCA (Automatic Subject Citation Alert) is a commercially available SDI system covering the journal literature. The repertoire of questions which ASCA can utilize includes cited references, words from titles, authors, organizations, etc., and allows for logical combinations of these questions. This paper discusses differences and similarities between "citations" and "words" in retrieving and disseminating information. The problem of user-system interaction is explored, and some techniques for developing effective interest profiles are described. Although ASCA is a multi-disciplinary system, examples from fields like synthetic chemistry and biochemistry are provided.

During the past three years, the Institute for Scientific Information has been testing and operating the first large-scale selective dissemination system commercially available to individual scientists. During this time, researchers in almost every discipline have been utilizing the *ASCA* (Automatic Subject Citation Alert) system. More than 500 scientists have been involved in the tests of *ASCA* files that cover approximately 300,000 current articles each year, requiring about 10 million indexing terms.

Many systems for the selective dissemination of information (SDI) have been reported. Most of these systems are designed to provide information to individuals in

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