

I am not permitted at this time to report the Department's plans to respond to these recommendations since we have not completed our appropriations hearings. I can say that Dr. Hollomon regards the prompt distribution of scientific and technical information to industry to be an important component of his plans for a civilian technology program, and he has constructive ideas on how to improve the situation.

In summary, the Department's role can be "spelled out" in these terms: 1. To see that all of the useful information produced in the course of the Department's own programs is made available to those who can contribute to, or benefit from the findings. 2. To make sure that the results

of all unclassified government sponsored research and development is supplied to the public promptly and in a convenient form. 3. To provide a clearinghouse service for technical translations and like materials. 4. To see that, from whatever sources are required, industry gets the information it needs.

In all of these endeavors we will continue to work with and through existing agencies, such as the major abstracting services and the specialized information centers. Our targets for the years ahead are—to improve our service, advance our efficiency, and augment our audience.

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## The Scientific and Technical Information Program of the National Aeronautics and Space Administration\*

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Received April 11, 1963

The National Aeronautics and Space Administration has been given a responsibility which can be described in quite simple terms understandable to both the technical and lay publics: and that is, to push back the frontiers of space. In so doing, the continuing research and development carried on throughout the national aerospace program is directed toward a far more significant objective; and that is pushing back the frontiers of knowledge and perception. Everything that NASA does, even when it results in the creation of a spectacular vehicle, or the most esoteric and advanced hardware, aims directly at the task of increasing man's knowledge of the world beyond him and, to a great extent, at a better appreciation of his own environment.

This pool or reservoir of knowledge must not become stagnant if we are to be alert to national self interest and to our responsibilities throughout the free world. Specifically, we must recognize the need for communicating, on the widest practicable basis, knowledge vital to the aerospace program within the aerospace family. However, we must not lose sight of the potential impact of this new knowledge, new techniques, and new innovations on our own industrial economy. By maintaining a clear

understanding of the broad spectrum of the many national communities to be served, we take a major step forward in building a national scientific posture which will contribute to our international energies and image. Therefore, and in summary, we view the scientific information deriving from NASA endeavors as a critical national resource.

We accept the premise that the information requirements which NASA must satisfy can only be met by a system that ensures *ready* access—for science, for industry, for the educational world, and for the general public—to NASA—generated scientific knowledge appropriate to a given need. As a result, NASA's scientific and technical information program has been designed to encourage the broadest and most effective use of the scientific knowledge at NASA's disposal. Mere availability of information is not enough. The information must be so collected, "repackaged" when necessary, and distributed that NASA's many publics can secure utmost benefit.

**Operating Principles.**—The new NASA scientific and technical information program is guided by five operating principles which merit identification and brief explanation: *First*, our products and services are designed for the ultimate consumer of knowledge—the scientist, the engineer, the laboratory worker. Of course, they can also be

\*Presented before the Division of Chemical Literature, 142nd National Meeting of the American Chemical Society, Atlantic City, N. J., September 12, 1962.

utilized by intermediate services, such as technical libraries, or by information centers. But the basic intent here is to give the scientist and technician a free choice to maintain his own current literature awareness, to make his own literature searches, and to obtain his own information.

*Secondly*, we recognize the element and need for *timeliness* in the acquisition and processing of information, in announcing its availability, and in distributing it to the users who need it most.

*Thirdly*, we recognize the critical importance of cooperation and collaboration with other existing information systems and services. The information explosion and its impact on scientific progress has made any other operating unthinkable. Unnecessary overlapping of coverage is not only uneconomical but acts as a direct deterrent to the required acquisition, control, and dissemination of a vast complex of scientific and technical information. Accordingly, our scientific information program works continuously and closely with both governmental and specialized professional information organizations. Within the federal family, for example, NASA collaborates with the Armed Services Technical Information Agency, the AEC's Technical Information Division, the National Science Foundation, the Office of Technical Services in the Department of Commerce, and the Federal Aviation Agency, to cite but a few. Similar collaboration has already been established in many cases with abstracting, indexing, and related services that concentrate on the vast bulk of formally published journal literature. Close cooperation has already been established with the Institute of the Aerospace Sciences, the American Meteorological Society, the Aerospace Medical Association, and with members of the National Federation of Science Abstracting and Indexing Services—of which the American Chemical Society is a member.

The extent of such tie-ins with other specialized technical information services may be illustrated by the recent agreement between the IAS and NASA. Historically, the Institute of the Aerospace Sciences, in its abstracting service, published a first-rate monthly abstract journal which provided partial coverage of the report and published literature in aerospace science. With the vast expansion in published literature both at home and abroad, it was recognized that this mass of both report and open literature must be intelligently divided if comprehensive coverage and service responsibilities were to be served. Therefore, beginning in January, 1963, the IAS will extend its efforts to provide coverage in depth of the published literature in aerospace sciences while our NASA program will concentrate on similar coverage of the vast report literature. Both journals will be published biweekly but each on an alternate week. Both the NASA and the IAS journals will utilize the same indexing system. This is but one example of the cooperation which will be required for the necessary intermesh of aerospace research and development information. We at NASA recognize quite clearly the necessity for assuring that the output of our information program becomes input to other allied information systems, and *vice versa*.

*Fourthly*, we believe that minimum centralization in our scientific information program is fundamental. The necessity for rapid and flexible service, in keeping with

our first principle of user orientation, rules out any great degree of centralization. Centralization—yes—but this is limited to central processing where efficiency, economy, and speed significantly accrue. We feel that each participant in our national space and aeronautical programs should have at his immediate disposal the information services, the products, and the tools he needs to use locally in support of his work. Having to direct a request to a major central information office in Washington should be the exception rather than the general rule.

*Finally*, the NASA program recognizes that no type of service, no one reference tool, and no one bibliographic pattern can ever satisfy the many "publics" to be served—which include thousands of organizations and hundreds of thousands of individual scientists and technicians.

Therefore, our publication program must obviously produce technical reports as primary records of NASA undertakings, but it must also produce many other second-stage publications which collate, resynthesize, integrate, or "repackage" the mass of material contained in such basic records. Our bibliographic services must provide announcement journals and indexes and, in addition, a wide range of continuing and demand bibliographies, together with an extensive reference service, and a machine-search capability to satisfy specific requirements in the greatest depth possible. These are but a few of the many products and tools for the many publics.

Briefly then, these five principles—(1) of service for the ultimate user, (2) of timeliness, (3) of cooperation and collaboration with other information systems, (4) of minimum centralization, and (5) of information tools designed for a variety of users—determine the approach and objective of the NASA scientific information program.

**Information Operations.**—In our day-to-day operations, three principal work areas are easily defined: first, the acquisition and bibliographic control of all information resulting from, or necessary to support, the tremendously varied efforts in aeronautics and the space sciences; secondly, the dissemination of this information within the NASA community itself and to many other national and international audiences; and, finally, a publications effort designed to provide both basic and supplementary interpretive publication of all information accruing directly from NASA's undertakings.

The basic material fed into NASA's information system is the technical report covering a specific piece of work in the aeronautical and space science and technology fields. The current input is at the rate of 25,000 items per year and covers all available report material of value from NASA and non-NASA sources, domestic and foreign. We utilize a short informative abstract to communicate this scientific information. However, to provide for subsequent retrieval of the abstracts and information which they describe, all documents selected for the central collection are indexed in depth. A printed index is prepared to permit local searching and retrieval of the information by the individual scientist at the bench or the engineer on the line. At the same time, magnetic tapes are prepared for computer-based retrieval at our central facility or at field locations which have access to computer equipment. This indexing at two levels is provided to assure that both retrieval systems may be used at maximum efficiency. In the case of the printed index, documents are analyzed

to determine the four or five most significant subject index points—the sheer physical size of the printed index is a self-limiting factor pertaining to the depth of indexing. In the case of the computer tape, the fundamental manipulative ability of the computer permits an almost unlimited number of entries to fully characterize a document—in our operation, we are finding the number of subject entries for each document is usually in the range of 20–25. Our indexing language or vocabulary for both purposes is carefully controlled. Special attention is given to providing enough flexibility for the vocabulary to grow with scientific and technological advances, while at the same time placing the index terms in an ordered system so that all users—scientists, engineers, indexers, documentalists, librarians—may receive full benefit from the retrieval devices. Indexing is a vital artery of our system because so much of the over-all effectiveness of an information program depends on being able to retrieve all the materials pertinent to specific inquiries or needs.

**Technical Publications Announcements (TPA).**—Our basic announcement journal is the bi-weekly *Technical Publications Announcements (TPA)*.<sup>\*\*</sup> The publication cycle is such that all items received within any two-week period are announced in the journal within four to six weeks following receipt by our central Facility. Each issue of *TPA* has two major sections: the first is a listing of abstracts arranged in 34 general subject categories for ease of scanning; the second section comprises four indexes: subject, corporate source, author, and report number. The detailed subject index provides multiple approaches to the subject content of each abstracted document through the use of specially prepared “notations of content” incorporating three of four key words or phrases. This subject index is of the chemical abstract type and is suitable both as a retrospective searching tool and as a current scanning device to assist users in identifying newly announced items of significance to them.

Additionally, and to assure that our announcement journal remains a current desk tool, all four indexes are cumulated on a quarterly, semiannual, and annual basis. These cumulations are issued within two to four weeks after the close of the period they cover.

One week prior to issuance of its abstract journal, the NASA system provides for automatic distribution of all the documents covered in the journal to participants in the aerospace program—to NASA Centers, contractors and grantees, other government agencies and their contractors, depositories, etc. This automatic distribution may be either comprehensive or selective, depending on the stated needs of an individual recipient. Again, this automatic distribution is in keeping with the principle of minimum centralization and maximum local access.

Its objective is to provide immediate local access to reports of interest without the delay of requesting them from geographically distant points. Backing up this initial automatic distribution, our central Facility answers specific requests for individual documents, either in full-size or microform copy. Our microform copy is a 5 × 8-in. diazo transparency which represents a composite of all the best features of other existing microform programs. The 5 × 8 transparency was selected because it embodies a high degree of compatibility with other programs and because it provides a unitized record with extremely high readability and reproducibility qualities.

Each microform, using a reduction of 15.4 to 1, may record up to 75 standard page images, thus accommodating approximately 80% of the documents in NASA's collection on a single microform unit. The microform can be viewed in most existing film readers, on reader-printers, and can be reproduced on all available printers and reader-printers. The microform has also been engineered to permit easy conversion to a tab-card size should future developments render this desirable.

**Information Products and Services.**—I have spent some time in describing the various products we use routinely in our scientific and technical information program. I would be remiss if I did not note briefly that reference services are available from our central Facility to meet the needs of the scientist, the engineer, his company or laboratory. These operations are designed to satisfy both generalized and highly specific requests for information assistance. They are designed, if you will, to back up the local technical information resources available to the user of aerospace information.

Utilizing computer techniques, our Facility prepares bibliographies in selected subject areas on a continuing basis and special bibliographies to serve information needs of individual requestors.

There are many other significant program elements which contribute toward bringing vital information into the hands of our many “publics” on a timely basis. The expanding translation program, the organization of project-type information, the “repackaging” of information for the industrial and educational communities, the handbooks, source books, and state-of-the-art summaries—all bear distinctly on the information challenges of the aerospace age. Unfortunately, the limited time available at this session precludes a discussion of them in any detail.

We in the Office of Scientific and Technical Information will welcome your input into our planning and improvement of service. If this admittedly broad-brush treatment of our program has sparked any general or specific questions, let me know and they will be answered fully and promptly. For those who wish a detailed description of the NASA program, a summary of our objectives and operations is available upon request to my office.

<sup>\*\*</sup> After January 1, 1963, the NASA abstract journal was rechristened *Scientific and Technical Aerospace Reports (STAR)*, and published on a semimonthly rather than biweekly basis.