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AGARD

ADVISORY GROUP FOR AEROSPACE RESEARCH & DEVELOPMENT

7 RUE ANCELLE 92 NEUILLY-SUR-SEINE FRANCE

AGARD CONFERENCE PROCEEDINGS No. 78

on

Information Analysis Centres

NORTH ATLANTIC TREATY ORGANIZATION

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AGARD Conference Proceedings No.78 (2)

NORTH ATLANTIC TREATY ORGANIZATION

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT

(ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD)

(8) A.W. MURDOCK

INFORMATION ANALYSIS CENTRES

(7)

INFORMATION ANALYSIS CENTRES, AGARD Technical Information Panel, Amsterdam, 10 November 1970 (7B)

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G.S SIMPSON (9)

This Specialist Meeting sponsored by the Technical Information Panel of AGARD was held at the Aviodome, Schiphol Airport, Amsterdam on 10 November 1970.

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FOREWORD

The idea of holding this Specialist Meeting arose originally out of discussions within the Technical Information Panel of AGARD.

There is now world-wide appreciation of the problems and difficulties of extracting reliable technical information from the vast quantities of publications emerging from the world's Press, and the technological explosion of the past years has high-lighted the essential nature of the problems. There is an essential requirement for information staff to extract, assess, analyze and communicate current "state-of-the-art" documents in order to permit the engineer and scientist to get on with the job for which he was trained rather than that he should spend valuable time searching through masses of information, much of it irrelevant, which nowadays beset him on all sides.

The fact that this Conference took place and was so well supported by the NATO Countries is ample evidence of the concern with which the problem is viewed internationally. Both the papers and the discussions have stirred interest and generated much in the way of ideas and an awareness of the wide-spread and growing insistence that the problem must be accorded its proper recognition. Also, that it exists not only in the Defence field but in Industry and the world at large.

The Conference was, it is believed, the first of its kind to be held within the NATO Alliance and presented an opportunity for the delegates to benefit from the experience in the field of information analysis centres gained in the United States and to hear of and discuss the need for similar centres in Europe.

Thanks are due to all those who were at such pains to prepare and present the papers to the Conference: these papers were the framework upon which the success of the Conference was built. It is hoped that having aired the problem and presented one means of combating it, the ripples will spread and momentum gained rather than lost.

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North Atlantic Treaty Organization, Advisory Group for Aerospace Research and Development
INFORMATION ANALYSIS CENTRES
Published February 1971
68 pages

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The objective of the meeting was to assess the nature and value of Information Analysis Centres and to consider how they might be applied to NATO needs.

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Information Analysis Centres are manned by teams which include scientists, engineers and information specialists. These teams review and evaluate information, and design and operate systems to organize, store, retrieve, and disseminate this information.

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OPENING ADDRESS

by

Mr. Anton J. Marx
Director of the National Aerospace Laboratory (NLR)

Mr. Anton J. Marx, Director of the National Aerospace Laboratory and Netherlands National Delegate to AGARD, gave a welcome address to the participants at the Specialist Meeting, also on behalf of Prof. Dr. Ing. H.J. van der Maas, Head of the Netherlands Delegation to AGARD.

Mr. Marx briefed the audience on the role of AGARD within NATO, and particularly described the activities and achievements of the Technical Information Panel.

His comments concerning Information Analysis Centres were as follows:

"Among the numerous scientific and technical information services existing in our contemporary society, none is so sophisticated, or so little known as the Information Analysis Centre (IAC). It is considered more and more essential that scientists and engineers have a real responsibility to actively help in solving information problems.

One way this can be done is through the IAC - a scientific or technical entity - existing in a scientific or technical environment such as a research laboratory, whether it be a national laboratory, a private sector laboratory, or a university laboratory. IAC's are known to exist not only in the USA but also in other countries, although under different names. One of the purposes of this Specialist Meeting is to provide each of you with the opportunity to learn about the concept and operation of IAC's. In this context, the Technical Information Panel has invited four speakers, two from the USA, one from France and one from the UK, all of whom are engaged in such activities, to comprehensively present this type of service.

As IAC's are very expensive to operate, international cooperation seems to be indicated and therefore two subjects were selected to which the IAC concept might be applied in an international context. Both these subjects, that is, air pollution and maritime pollution, are increasingly becoming a matter of concern as they are gradually disturbing the equilibrium of our environment. It should be pointed out, however, that the chosen subjects merely serve as examples for application of the IAC concept. It does not imply that their implementation is actively being pursued by the Technical Information Panel, nor that any steps have been made in this direction.

It is hoped, however, that the discussion today may contribute to an international effort to stimulate activities for the solution of these important problems in our respective communities.

Wishing you successful and instructive participation in this conference, I now declare the meeting open."

KEYNOTE ADDRESS

by

Mr. Walter C. Christensen
Director of Technical Information, DoD

Ladies and gentlemen, it is indeed an honor to have been selected as the keynote speaker for this specialist meeting on information analysis centers. As the keynote speaker, it is my function to set the stage for the individual presentations which will follow. In view of the expertise possessed by the individual speakers, I am quite happy to address the subject at hand on a general basis rather than get into details.

As a beginning, I would like to recite some statements contained in a 1963 United States Presidential Advisory Commission report on Scientific and Technical Information which was chaired by Dr. Alvin Weinberg, the noted nuclear physicist. "The specialized information center is a major key to the resolution of our information system." "Ultimately, we believe the specialized analysis center will become the accepted retrieval of information, switching, interpreting and otherwise processing of information from the large wholesale depositories and archival journals to the individual user." This particular report laid the foundation for the formal recognition and indeed in many cases, the establishment of information analysis centers in the United States and, I suspect, in other countries as well. As further recognition of the importance given to the functions of information analysis centers, a 1969 report sponsored by the United States National Academy of Sciences/National Academy of Engineering stated: "A singularly pervasive conclusion in regard to scientific and technical communication is that the functions performed by critical reviews and compilations - digesting, consolidating, simplifying, and repackaging for specific categories of users - are essential if information is to be used effectively." It is these types of functions that the information analysis centers are established to perform. At this point, it would be well to define what we mean by an information analysis center. Unfortunately, the term information analysis center means different things to different people. However, one characteristic which I think is common to all definitions is that the centers deal in information - evaluated, condensed, and normally not available to their user community. A sharp distinction must be drawn between the operation of a document storage and retrieval operation such as the Department of Defense's Defense Documentation Center and an information analysis center on this basis. Dr. Edward Brady of the United States' National Bureau of Standards defines an information analysis center as "simply a group of technically trained persons who have accepted a responsibility to gather relevant information from the world's literature and other sources pertaining to a well-defined field of specific missions, to gather and store this information, and then to analyze and synthesize it in such a way that new knowledge is created." In other words, the information analysis center takes the ever increasing amount of information being generated in its specific subject or discipline area, analyzes it separating the wheat from the chaff and then stands ready to provide the best, most up-to-date information available in a manner most meaningful to its users. In the case of the U.S. Department of Defense information analysis centers, the products tend to fall into two categories: (1) first, replies to specific questions from users - for example, alloy X is cracking under vibration load - what can we do? Answer: change heat treatment or go to alloy Y; (2) secondly, the centers put out various technical reports giving the latest engineering information, as for example, the widely used "Aerospace Structural Materials Handbook".

At this point I would like to digress for just a moment and discuss the subject areas and disciplines to which I feel information analysis centers would be the most benefit. In analyzing information needs of scientists and engineers, I have come to the conclusion that the scientist does not have anywhere near as serious a problem in obtaining needed information as does the engineer. The scientist normally works in a well-defined area. He knows most of the people working in the area and he also generally knows where to go to get information which he needs. On the other hand, the engineer, or in the broader context, the technologist, has an increasingly difficult problem. This is the individual who designs and produces the end item and, in this age of rapidly advancing technology, his ability to maintain a knowledge of up-to-date engineering information even in a narrow disciplinary area becomes an exceedingly difficult, if not impossible, task. Added to this is the multi-disciplinary nature of many of the products which we are currently developing. It is my opinion that the rapidly advancing engineering or technological areas are where the information analysis centers are most beneficial, particularly in those fields such as ceramics, plastics, and exotic materials which are undergoing rapid changes in the state-of-the-art.

Up to now I have presented a positive view of the importance of the information analysis centers. However, I would feel remiss if I did not add some words of caution which I don't believe will be forthcoming from the speakers to follow because of their intimate involvement in the operation of centers. First, while it is evident that information analysis centers present a theoretically ideal solution to the information explosion, it must be recognized that these centers are very expensive to operate. Costs vary from about $100, 000 per year to over $1 million per year. Secondly, a measurement of benefits achieved from an information analysis center is extremely difficult as is the case with most technical information activities. Therefore, justification for the establishment and continued operation of centers is a major task. In addition, many of the people who could benefit from the information analysis centers are unaware of their existence, or not motivated strongly enough to utilize them (the inertia factor). And finally, while centers may be extremely beneficial in a particular subject or discipline area during the initial application phases, their value in most cases will decrease with time. Too often, centers are allowed to continue operation beyond the time where they are returning acceptable benefits in relation to their cost. In this regard I am reminded of a statement made by Alan Rees of Western Reserve University that: "The information retrieval field has been plagued for many years by busy people spending large sums of money, designing - or attempting to design - phantom systems for non-existent people in hypothetical situations with unknown needs".

In the U.S. Department of Defense we have instituted a policy of service charges to solve these problems at least in part. While we still are in the early stages of implementing this policy, it does appear that the users are willing to pay for the services they receive from our information analysis centers. Our implementation of this service charge policy has been made more difficult because the users have become accustomed to receiving the services free of charge. I believe that for countries who are establishing or contemplating establishing information analysis centers, a service charge policy should be instituted from the very beginning. In addition to addressing the problems which I have previously enumerated, it will assure that the center is indeed responsive to the user needs - and we must all remember that our job is to serve the users - not to create information activities for our own edification.

In summary, I strongly support the information analysis center concept but at the same time recognize many of the difficulties involved in implementing this concept. I feel that this meeting is most timely and I sincerely hope that many of these areas which I have covered will be subject to much more detailed discussion during the remainder of the session.

There is one final comment I would like to make which I believe is a significant breakthrough in furthering our cooperative efforts in technical information activities. This is a press release put out by the United States' Department of Defense on October 15, 1970, which I would like to quote in its entirety.

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NEWS RELEASE No. 819-70 — 15 October 1970
Office of Assistant Secretary of Defense Public Affairs
Washington D. C. 20801

DOD ACTS TO MAKE MORE INFORMATION AVAILABLE TO GENERAL PUBLIC AND TECHNICAL COMMUNITY

Secretary of Defense Melvin R. Laird announced today new actions taken recently to accelerate achievement of the Department's objective of making more information available to the general public and the technical community, consistent with national security.

Specific actions taken include:

1. Institution of procedures to assure that only that Defense technology which clearly needs to be protected in the national interest bear a security classification and that such security classifications be retained for the shortest possible time.

This new policy means that security classification decisions will be reached only after consideration of competing advantages and disadvantages. In the past, major emphasis for classification has generally been placed on the possible benefit of the information to potential enemies without consideration of the benefits which could accrue to the United States government, industry and domestic community, and our allies through open and effective technology dissemination. Now, both reasons must be considered in making the classification decision.

2. Initiation of a number of programs designed to declassify existing technological information which no longer needs to be classified.

These actions, which will reduce or avoid costs within Defense and industry by eliminating a significant amount of security maintenance expenses, will also make many previously classified technical reports available to the scientific, academic and technical community.

3. Virtual elimination on technical reports of the use of statement which limit distribution of those documents, whether classified or unclassified, to only selected segments of the Government community.

These limiting statements have previously restricted certain documents to small project or special interest groups. The impact of this action can be judged by the number of Defense technical reports now being withheld, because of limiting statements, from the Department of Commerce's National Technical Information Service (NTIS), the primary outlet for Department of Defense technical information to the public. Of the approximately 45,000 Defense technical documents prepared each year, some 17 percent are withheld for security classification reasons while some 39 percent are unclassified but withheld because the originator has placed a limitation on the report's distribution.

The net result of these major policy changes will be a revitalization of applying all the factors involved in the Department of Defense security procedures and more effectively transfer Department of Defense technology within Government and the private sector. Also, these actions will assist in further reducing technology communications barriers with our allies and enhance international cooperation.

END

CONCEPT, MISSION, AND OPERATION OF SCIENTIFIC AND TECHNICAL INFORMATION ANALYSIS CENTERS

by

J. W. Murdock

Battelle Memorial Institute
Columbus Laboratories
Columbus, Ohio, USA

SUMMARY

The lecturers discuss Information Analysis Centers (IAC's) in three parts: concept, mission, and operation. Since there is an array of existing scientific and technical information services varying from the conventional library, through special libraries and document depots to IAC's, the first portion of the lecture considers what an IAC is, how it relates to other information services, and its fundamental concept. Color slides are employed as visual aids.

The second portion of the series treats the idea of the mission of an IAC. Accepting now that the participants understand the idea of an IAC, and how it relates to other specialized information services, the mission of an IAC is considered in the light of its users, or peer group, how unpublished information is obtained and used, and how feedback helps the IAC achieve its mission. Two non-government supported IAC are described along with one government center.

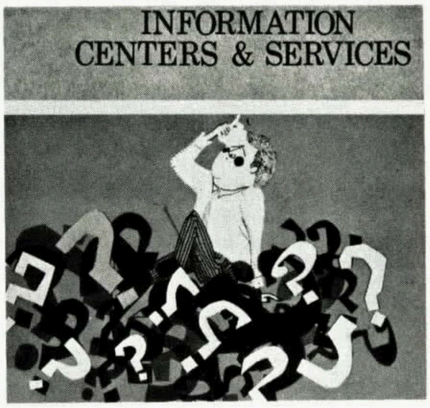
The third portion of the series considers operational aspects (administration and management) of an IAC. Based on close contact with over a dozen operating IAC's, the lecturers relate actual experiences pertaining to the recruitment and utilization of competent research scientists and engineers in information analysis work, advantages of working in an IAC environment, key problems in day-to-day operation, and the ever present problem of money.

CONCEPT, MISSION, AND OPERATION OF SCIENTIFIC AND TECHNICAL INFORMATION ANALYSIS CENTERS

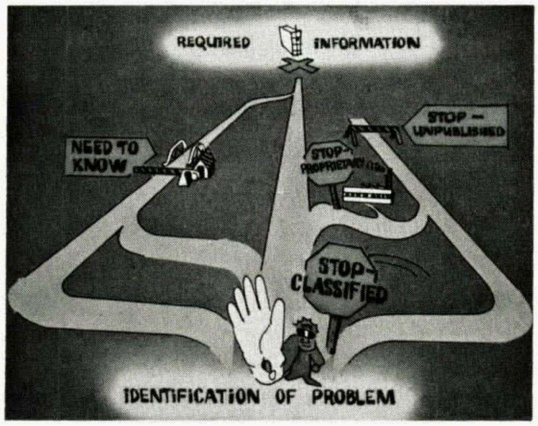
by

J. W. Murdock
Battelle Memorial Institute
Columbus Laboratories
Columbus, Ohio U.S.A.

Concept



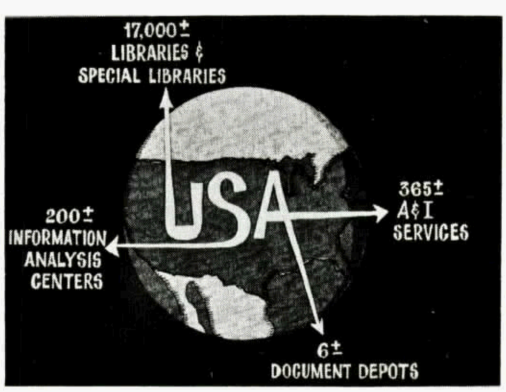
Slide Nr 1 clearly shows the state of a person's feelings when he is confronted with the array of scientific and technical information centers and services currently existing.



The second slide shows the two major deterrents that prevent anyone from determining the sum total of all information centers and services as well as the total state of knowledge in any particular subject. It will be noticed that there are two main deterrents to the ultimate capability for knowledge transfer. These two deterrents are "need-to-know" which is a defense oriented requirement, and "proprietary information" which is a "dollar" oriented requirement. Obviously, nations have information in science and technology which they cannot release to the general public. This information we call defense oriented. The requirement not to release this information to the public whether it be purely in defense or a matter pertaining to international relations is widely accepted.

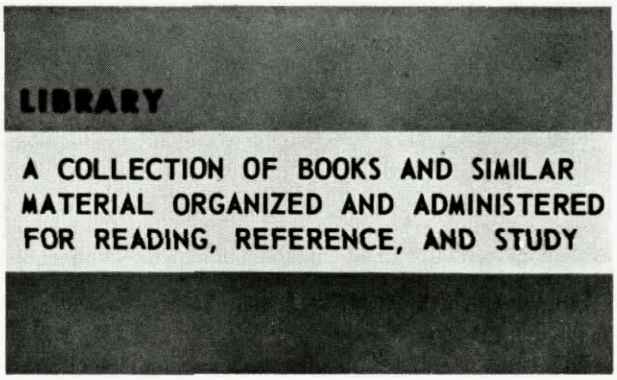
The second deterrent to maximum knowledge is caused by proprietary information. Whenever an industrial organization develops scientific or technical information which would provide that organization with a competitive advantage, a technological advance, or a completely new piece of hardware, the organization will not release this information until it either has obtained patent protection or a copyright.

Both defense oriented and proprietary information deterrents certainly prevent anyone from obtaining a total picture in any particular area. However, by the utilization of a scientific or technical information analysis center it is quite possible to intellectually compensate for that information not readily available. Having mentioned the two deterrents, we believe that our state of knowledge regarding the U. S. information centers and services approaches 90%, whereas our knowledge of information centers and services in the balance of the world we would estimate to be of the order of 20%.



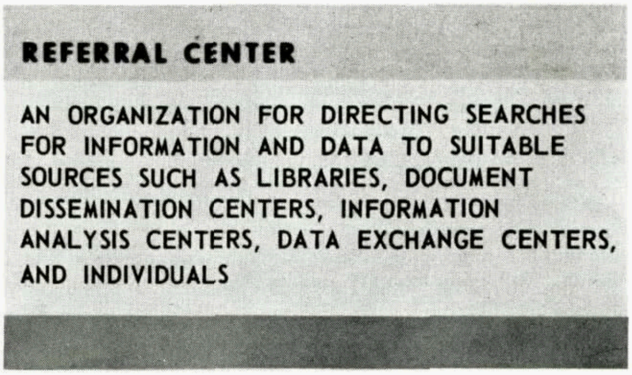
Slide Nr 3 shows the array of scientific and technical information services and centers in the U. S. This slide, with its impressive number of special libraries and libraries, abstracting and indexing services, information analysis centers, and document depots, is illustrative of the problem facing anyone who wants to obtain selected information. Adding to these numbers the thousands of technical reports being produced annually, the tens of thousands of scientific and technical articles being reported by the primary journals, and the literally hundreds of seminars and symposia with their proceedings, one can't help but develop a feeling of hopeless futility. Not only does one not know where to go to get the information or data he needs, but also he doesn't know which one of these facilities is most likely to serve him best. Finally, most technical people don't appreciate the differences among these several types of information services.

In order to arrive at an understanding of how an information analysis center differs from the other information services which are available, we are going to present a series of definitions. These definitions are simply for the purpose of explaining what we mean by the terms we are using.

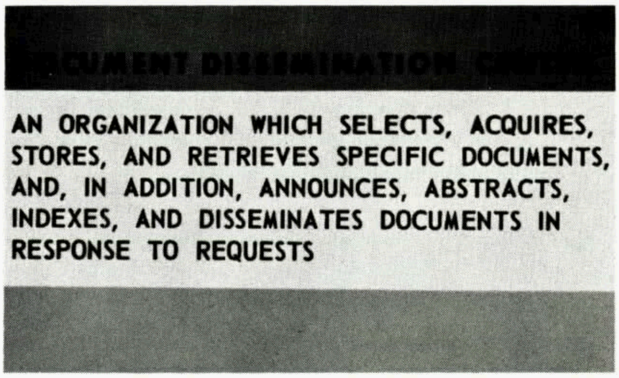


Slide Nr 4 contains our definition of a library, which is a collection of books and similar material organized and administered for reading, reference, and study. Libraries are not information analysis centers, as will become clear as our briefing unfolds.

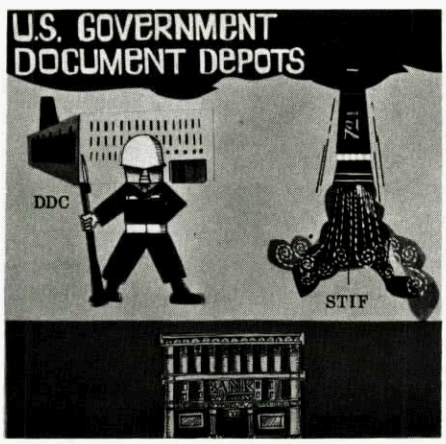
The next type of information service which is widely known is the referral center as shown in Slide Nr 5.



Our definition is, a referral center is an organization for directing searches for information and data to suitable sources such as libraries, document dissemination centers, information analysis centers, data exchange centers, and individuals. In the United States a typical example of a referral center is the National Referral Center for Science and Technology located at the Library of Congress in Washington, D. C. This referral center is primarily concerned with directing individuals or organizations to specialized sources of scientific and technical information anywhere throughout the United States.

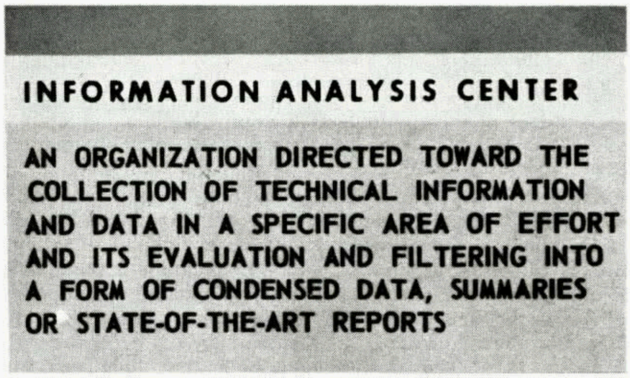


Slide Nr 6 contains our definition of a document dissemination center. A document dissemination center is an organization which selects, acquires, stores, and retrieves specific documents and in addition announces abstracts and indexes, and disseminates documents in response to requests.



Slide Nr 7 indicates three major U. S. Government document depots, for example, the Defense Documentation Center which stores the technical reports produced by the United States Department of Defense Research and Development effort; the scientific and technical information facility of NASA, which stores the technical reports produced by NASA's scientific and technical R&D program. The third document dissemination depot represented on our slide is the Clearinghouse for Federal Scientific and Technical Information. The Clearinghouse primarily stores that information which is Unclassified and unlimited, and produced by any organization of the Federal Government. The information so stored is announced For Sale to the U. S. Public and to the World. Reports purchased can be either hard copy or in a micro-form.

In Slide Nr 8 we show our definition of an information analysis center. An information analysis center is an organization directed toward the collection of technical information and data in a specific area of effort, and its evaluation and filtering into a form of condensed data, summaries, or state-of-the-art reports. The balance of our presentation will be concerned with elaborating the concept, the mission, and the operation of an information analysis center.



Information analysis centers were created to overcome three major problems in scientific and technical information transfer namely:

(1) the variety of ways in which information can be originated, whether through primary journals, secondary journals, letters, trip reports, technical reports, person-to-person, proceedings, or phone messages, each with its attendant different time lapses

(2) scientists and engineers impatience with great masses of paper (most scientists and engineers would rather create new data or information from the laboratory than submit themselves to the drudgery of plowing through the plethora of stored information resources, many of which we've already mentioned)

and (3) management's critical need to know what the state of the art is now.

These three circumstances or problems still exist today and will exist indefinitely. And while it is clear that these problems can be overcome through the use of an information analysis center, the cost of such a center precludes their existing except in those areas where there is some combination of real need, great research and development activity, and progressive enlightened management.

Slide Nr 9 shows a number of pamphlets of information analysis centers sponsored by the U. S. Department of Defense. Since immediately after World War II information analysis centers have been growing in the United States at the rate of approximately seven per year. NASA has built numerous centers, the Atomic Energy Commission has created over 20, the Department of Defense has roughly 20, the Department of Health, Education, and Welfare has built in excess of 20, the Department of Agriculture has several, as have numerous other Government agencies and departments. The U. S. Private Sector has created numerous new information analysis centers, some to serve only a particular company, others to serve groups, for example: The Copper Development Association's Technical Data Center located at Battelle, Columbus. All of these centers, we must remember, have come into being while other information services continue to develop, for example the Library of Congress, the National Library of Medicine, the National Agricultural Library, the Defense Documentation Center, the

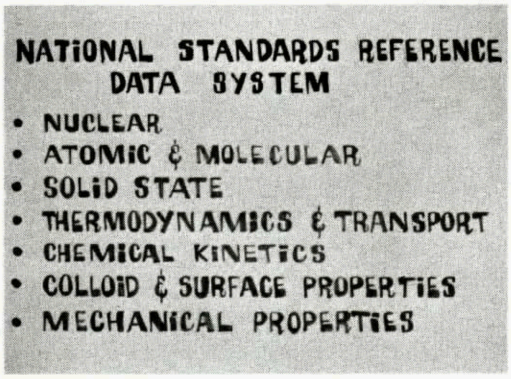
Clearinghouse for Federal Scientific and Technical Information. These libraries and document depots continue to grow and to automate, and at the same time, secondary services such as Chemical Abstracts Service, Bio-Abstracts Service, American Institute of Physics, the IEEE, the American Institute of Astronautics and Aeronautics, modernize and cooperate. While all these information services are developing, new primary journals are born, other primary journals expand, shrink, or die and certainly the number of society meetings, seminars, and all such continue to be held with consistent and certainly not decreasing regularity.

Raisoń d'etre

In view of the discussion thus far, a fair question, frequently raised, is Why Then An Information Analysis Center? Let's consider for a moment what it means to have all these information services that we've previously discussed such as a library, a special library, a documentation center, a referral center, thousands of journals and millions of articles, abstracting and indexing services, and our depots. Instead of answering the question direct, let's ask some new questions. Who is going to study all of the information being produced? Who is going to compress all of the information in any one subject area to ascertain what is going on, especially if he's using information from the published journals, most of which is already two years old? Who, with the fast turnover in personnel among organizations in Government, really knows what is going on in any particular subject anywhere in his own country as well as in the world? And in what subject areas do we really have to know what is going on? Is it to be expected that the average scientist and engineer can possibly know everything going on in his specialty?

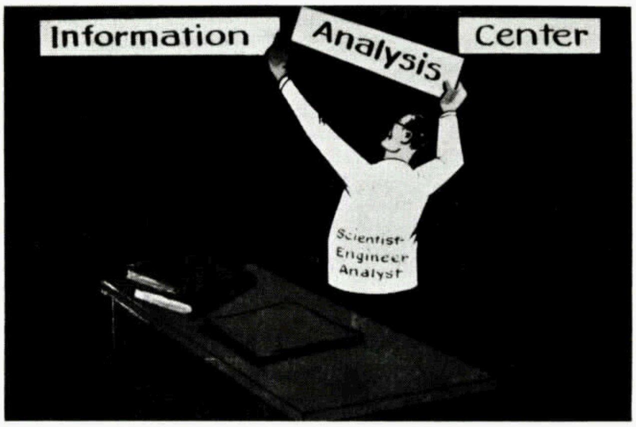
Most of us have to answer these questions in the negative sense; that is we really don't know what's going on throughout the world. But in many subject areas wherein there is great research and development activity and wherein there is a real need for a particular nation or a particular industry to make real progress, it is required that some one or more persons get on with the serious business of analyzing not only the published literature but any other input they can get. For this reason then, several nations and many industries have created information analysis centers. Utilizing not only the published literature but an entire array of other kinds of inputs such as trip reports, telephone calls, informal communications in the forms of letters, the foreign literature, as well as primary journals and face to face contact, compressions and analyses are produced by formally organized facilities whose main objectives are to determine what is going on.

This then is the raisoń d'etre, or the basic concept, behind an information analysis center. It is an organization of one or more scientists, engineers, and information specialists, committed at least part time to providing to a specialized audience the intellectual service of acquiring, evaluating, integrating, condensing, and analyzing available information or data pertaining to a specific mission. The center provides answers to technical questions and provides to its specialized audience authoritative and timely data arrays, analyses, monographs, or state-of-the-art reports. Slide Nr 10 shows a list of information analysis centers being developed within the National Standards Reference Data System.

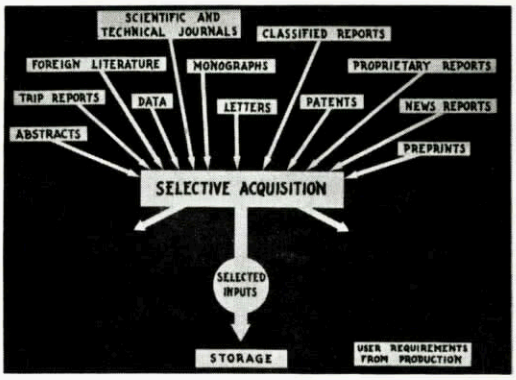


COFFEE BREAK

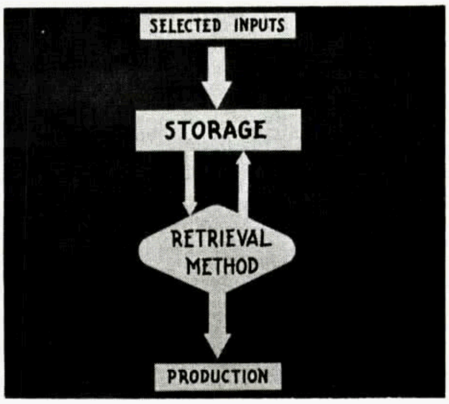
Mission



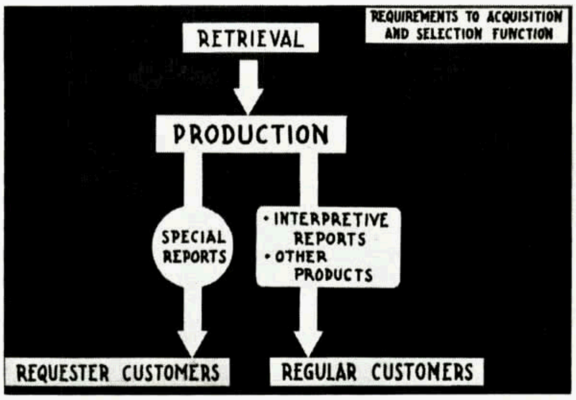
Slide Nr 11 is being used to introduce this portion of our briefing in which the mission of an information analysis center will be described. Notice in this slide that the word analysis is emphasized. Throughout the United States this word differentiates the information analysis center as an information service from all other information services such as libraries, document depots, referral centers, and abstracting and indexing services. The mission of an information analysis center is accomplished by the judicious application of effort to three main functions: namely, acquisition, storage and retrieval, and production. The objectives of the mission of the information analysis center are pursued through a series of scientific or engineering tasks involving one or more disciplines. Knowledgeable professional scientists or engineers are used to direct the acquisition function. The professional is used to obtain unpublished information as well as analyze published information. Obviously, this requires traveling, but traveling stimulates the analyst, it helps keep him in close contact with his professional peers and it provides him with added insight into the information needs of his technical associates. Also, utilizing a professional scientist or engineer to acquire unpublished information serves to announce the analysis center mission and to emphasize its technical orientation. The acquisition function is depicted in our twelfth slide, which as you can see is colored red for danger.



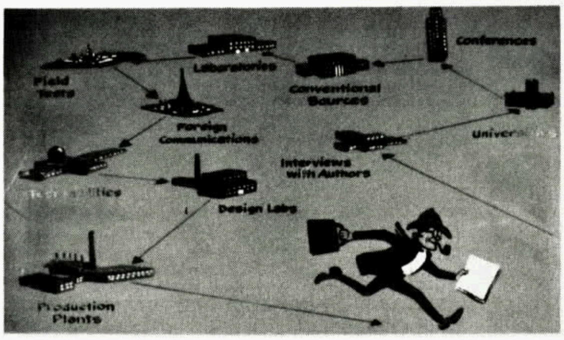
The mission of an information analysis center cannot be achieved without an aggressive and continuing acquisition program. Once the center has developed its sources of information, some of which may be as old as two years, but many others of which are as current as today, the center proceeds to its next function namely, storage and retrieval.



Slide Nr 13 is colored yellow for caution. In achieving the mission of an information analysis center it must be kept in mind that the main objective is to turn out analyses, not to spend all of your resources building a glamorous system or storing and retrieving information through the use of sophisticated devices. It is a very easy matter to become so preoccupied with the techniques and problems of the processing of information itself that one loses his recognition, of the objective, that the job at hand is to analyze, not just to store and retrieve. This viewpoint is further emphasized in our fourteenth slide which is colored green, for production, or for money. The point being - if your analyses are not well received, you are out of business.



Our twelfth, thirteenth, and fourteenth slides were as you will recall colored red for danger (acquisition), yellow for caution (storage and retrieval), and green for production or (money). These three colors are the same colors that are in most U. S. traffic lights.



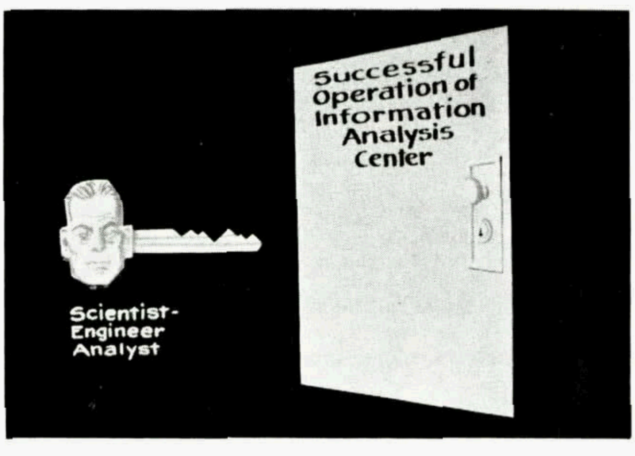
In a sense the overall operation of an information analysis center is represented by our fifteenth slide; let's consider this slide. We see a scientist/engineer dressed somewhat like Sherlock Holmes searching for the latest inputs in the area which he is analyzing. Having been given a specific assignment by his management, the scientist/engineer utilizes the information available in his storage and retrieval system as his starting point. For example, a typical assignment could easily be to determine the latest state-of-the-art in high-temperature metals development, and to recommend areas of research for continued development of improved alloys for jet engine turbine buckets. Clearly the latest work in this area is unpublished. Hence our analyst, finding out from the published literature who is doing the best research, where, and at what facility, will start to acquire directly from these people new unpublished information for use in his study. He will carefully integrate, analyze, synthesize, and compress not only the unpublished information he has obtained, but also that information which is pertinent and in his storage system. Once his analysis has reached a rough-draft stage, he frequently sends copies to other authorities who enjoy providing a critique of his effort. The result of the analysis is a state-of-the-art, a monograph, or a review. It is an intellectual contribution, frequently providing a new view of where we are, and where we should go. It always is a compression or repackaging of many, many items of information, some from the foreign literature, some domestic, some unpublished. And it always saves all the other technical people interested in the subject from having to read the heterogenous literature pertinent to the topic.

To further discuss the mission aspect of an Information Analysis Center, three Battelle operated centers will be described; one is a U. S. Department of Defense sponsored center, one an industrial sponsored center, and the third, a Battelle sponsored center. Details on these centers are eliminated here in the interest of saving space.

Operation

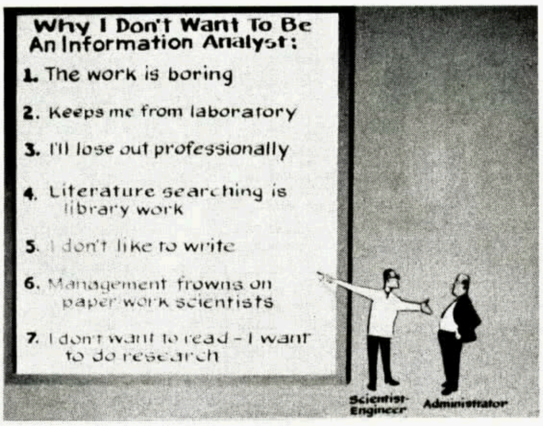
Like all other technical people with management responsibilities, we have developed a number of management and administrative principles applicable to information analysis centers. Some of our principles may not be unique to information analysis centers; indeed, some could well apply to other scientific and technical organizations. Whether they do or not you will have to decide, since the principles we will discuss have been based primarily on our experiences with information analysis centers operating in an applied research laboratory environment.

One fundamental principle in operating an information analysis center is that the director of the center must be a technical man. He should have had considerable research experience, and should have developed a favorable reputation among his peer group in his chosen field of technology. This is an absolute necessity if the information analysis center is to be considered other than simply a library. It is also necessary in order that the information analysis center technical staff receive a wholehearted reception as they go about their business of obtaining unpublished information. Our experiences indicate that a technical specialist is perfectly willing to discuss with another technical man things he is doing, including things which have not yet been published. But the interviewee is not likely to have too much patience with a person whom he identifies as being technically incompetent. Furthermore, and obviously, any product of the information analysis center is more likely to be well received by the technical group for which it is intended if that technical group knows of and respects the authors.



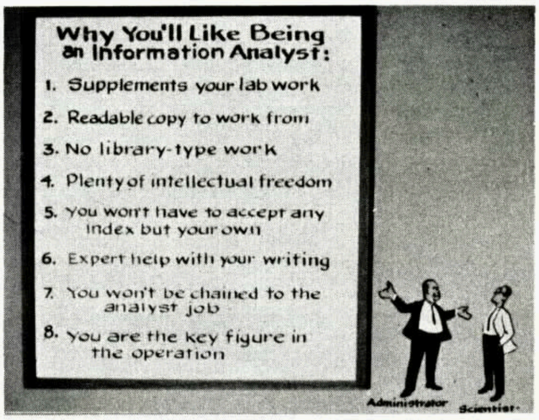
Slide 16 emphasizes the point which we have just been describing. Absolutely, the key element in the operation of an information analysis center is the utilization of competent scientific or technical analysts. It is almost impossible to over emphasize this element.

Generally speaking, scientists and engineers do not relish a steady diet of information analysis work. Of course there are some exceptions but in the main competent professionals are reluctant to participate in information analysis center work. The reasons a competent scientist or engineer gives are indicated in Slide 17.



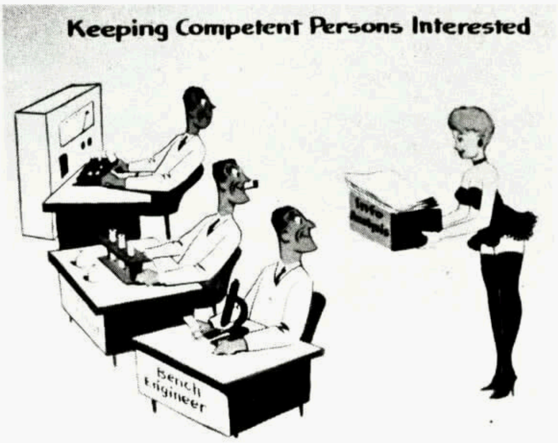
The reasons, as indicated in our Slide, very clearly suggest the second important principle in the operation of an information analysis center, that is, obtain and maintain the interest of competent professionals.

To obtain and keep the kinds of scientists and engineers you need in information analysis center work we have assembled a number of operational principles which we are indicating in Slide Nr 18, which follows.



We consider that these operating principles must be reasonably sound since we have been able to develop an information analysis center cadre of something of the order of 250 scientists and engineers, who are engaged, at least part time, in information analysis center work.

Having recruited the type of scientist or engineer you need for information analysis center work, a follow-on operating principle is not to forget to try to keep that person interested. Slide 19, which follows, emphasizes this also important operating principle.



Scientists and engineers who have participated in information analysis center work will state emphatically that the experience has done the following things for them:

(a) the experience has broadened their view of science and technology

(b) the experience has improved their capability to communicate

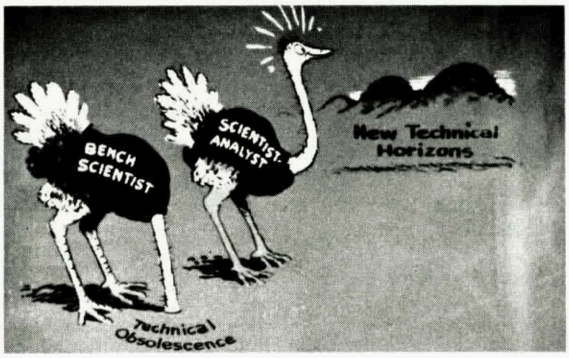
(c) the experience provided them with the opportunity to master a particular technical topic at a faster rate than otherwise practical

(d) participating in information analysis center work has made them more aware of the value of foreign literature

(e) in accomplishing state of the art analyses they have frequently identified areas of needed research, which they in turn had the opportunity to accomplish

and (f) because they have accomplished state-of-the-art analyses they are not obsolete or technologically inbred.

This last fact is so important for scientists and engineers who are in large organizations that we have pictured this advantage in Slide Nr 20.



We will conclude our briefing with a few comments about the cost of information analysis centers. They are expensive, varying from a small center with an annual cost of $60,000 to a large center having an operating budget in excess of $1,000,000. The size of a center's budget largely reflects its scope. That is, the broader the scope, the more technical people required, and of course, the more dollars required. We know of several private information analysis centers operated by U. S. industry which exceed $1,000,000 per year annual budget, and we have two information analysis centers at our laboratory that have annual budgets in this range. However, most information analysis centers in the United States operated with an annual budget in range of from $150,000 to $250,000.

From these figures, it is clear that information analysis centers are justified only when there is considerable research and development activity, when there is a large body of information resulting, and when there is an urgency that technological progress be made. When these three circumstances no longer exist, an information analysis center is not justified costwise.

Slide 21 is presented to indicate a topic of widespread interest in the United States.

At present, the Federal Government of the United States supports approximately 118 information analysis centers. The cost of operating these centers tends to rise as more scientists and engineers direct their information needs to these centers. A debate is underway on the question - should government information analysis centers charge for their services? The question has not yet been resolved.

FUNDING INFORMATION ANALYSIS CENTERS

by

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Columbus Laboratories
Columbus, Ohio, USA

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Introduction

Many scientists and engineers who obtain real understanding about the concept and operation of IAC' s say, "Great - I need one too!"

After that statement, the following sequence of events could occur:

(1) Scientists or engineers of like interests have a governmental, professional society, or industrial meeting - and from that meeting comes a committee.

(2) The committee has the task of studying whether their peer group needs an IAC - which it does!

(3) The committee reports its findings to the Heirarchy - and a resolution is passed - to wit - we need an IAC.

(4) Another committee is formed, and assigned the task of drawing up a plan for the needed IAC.

(5) The Planning Committee draws up the plan - and submits it to the general meeting - which endorses the Plan.

(6) At another general meeting, another committee is created to implement the plan - and thats the end of that - because the committee can' t raise the money to get the IAC plan implemented.

The point of this brief - and not really factual - introduction is to emphasize (1) that IAC' s are expensive, (2) that adequate funding is difficult to obtain and keep, and (3) that IAC' s cannot be justified for every aspect of science and engineering.

Another point I would like to emphasize early in this discussion is - its a discussion whose content is based on a paucity of facts as to costs. Not withstanding 20 years of promoting, designing, operating, and studying IAC' s, I have been unable to accumulate detailed cost data - except on those centers we ourselves operate. And even for these, I cannot really give precise figures, for the simple reason costs are kind of personal.

Nevertheless, what I will present is reliable, the cost figures reasonable, although broad, and the funding methods are representative of IAC' s in the USA.

General

The annual operating budgets of IAC' s in the USA range from $40, 000 to in excess of $2, 000, 000. Their staff size clearly varies widely too, from less than a professional man year per year, to dozens of professional man years per year.

Information/Input figures of IAC' s range from several hundred per year to thousands per month, while the specialized user audience (recipients of the IAC products) vary from several hundred to several thousand.

Most IAC' s use ADP support, although a few are so narrow in scope, and their annual information inputs so small, computer support is not necessary. Practically all IAC' s use SDI of some type - whether computer based or manual - so as to provide their specialized user audience a current awareness service. A large percentage of IAC' s provide also accession lists, selective abstracts, bibliographic retrospective search capabilities, data evaluation, and manipulations, and consultation. Visitors with appropriate bonafides are welcomed by every IAC.

Who Funds IAC' s?

The Federal Government of the US, through its Departments, Administrations, bureaus, and agencies, fund IAC' s. State Governments do likewise. Private industry funds a surprisingly large number of IAC' s, while groups of private industries with similar information needs also fund IAC' s. Universities fund others, and private research institutions, such as Battelle-Columbus Laboratories, supports several IAC' s itself, while at the same time operating Centers for sponsors on contract.

There is a strong belief among some circles in the US that most IAC' s are funded by Government (there are roughly 119 such centers). The fact is that private resources support a greater number of IAC' s than does the US Government. However, even though there are a few private industry centers operating with budgets in excess of $1, 000, 000/year, the biggest IACs in the U.S. are understandably Government supported - for example - National Space Science Data Center, National Weather Records Center, or National Oceanographic Data Center.

How do you know if you need an IAC?

Those of us who are convinced that an IAC is the way for scientists and engineers to overcome their "information dilemma" are equally convinced we can, after appropriate study tell when an IAC is needed. However, short of a study, there are a few rather obvious general guidelines that can be used to decide whether an IAC should be seriously considered.

First, there must be a significant R&D effort underway, involving at a minimum several hundred scientists or engineers whose efforts are directed toward an identifiable and specified objective. For example, if one assumes as I do that infantile paralysis (polio) can be largely prevented by Salk or Sabin innoculations, then an IAC on such a topic is unnecessary. If, for example, there are 500 scientists and engineers in NATO countries conducting R&D on air or marine pollution, or water resources management, or food preservation, or cancer chemotherapy, then a real probability exists that an IAC should be seriously considered. That is, a study should be conducted to define precisely what the IAC should do, how it should be designed, what the user audience really needs, and how to fund the IAC.

Next, because of the seemingly expensive nature of an IAC, there must be real pressure (national or international) for significant progress. There are, as you all know, some research activities which, w important, are not under great pressure to achieve practical results as soon as possible.

Other R&D programs are pressured - generally by cultures, societies, industries, and Governments - to move along at a fast rate. Without being specific, there is an IAC concerned, believe it or not, with research to improve a particular type of garden flower. Now to the lovers of this particular flower (who support their IAC), improvement in the flower is worthwhile - but not really critical. If they want to pay for an IAC - bless them - it' s their money.

The industrially supported centers I am familiar with utilize their IAC to guide the development of new products, new technological processes, patents, and new R and D efforts. In order to help keep the Company competitive, it is clear the IAC must produce significant results. Similarly, Governments have real need for rapid progress in many areas. For example, within the past several years, the Department of HEW, of the USA has initiated a number of IAC' s in areas of education - such as adult education, rural education and library and information sciences. These IAC' s represent a reinforcement of the trend in knowledge transfer in the US, a trend that clearly recognizes that to be effective, knowledge must be compressed, correlated, and analyzed by experts. Further evidence of this is indicated by the NIH also creating IAC' s - such as in Parkinson' s disease, and diseases of the human sensors - such as hearing and vision.

What to do?

Once a group of scientists and engineers have accomplished a scoping study, and can demonstrate an IAC is justified - to obtain funding requires convincing management - in short - selling them on the idea and its desirability. Our experience is that this is not easy - particularly in an era of shrinking R&D activity. But - some areas of R&D are increasing. And it is in these areas where an IAC becomes necessary.

If the management directing these increasing R&D programs is enlightened, it will support the establishment of an IAC - providing you make it crystal clear just what an IAC is - and does. If management gets the impression you are talking about another special library, you will surely have problems. Managers and directors of large R&D programs are quick to see not only the technical value - but also the management value of an IAC. They, possibly more so than anyone else in the effort, want to optimize the rate of progress in their program. Once they realize that an IAC significantly increases their capability for optimized progress, you will have all the support you need.

How big should an IAC be?

Once it is agreed that an IAC will indeed contribute to the optimization of research progress thru improved knowledge transfer, the question always arises - how much will it cost? There are no pat answers to the question - and few scientists and engineers who have studied the general problem will agree. Depending on how careful one is in identifying all the real costs (for example - some IAC' s get expert help at no cost to them) the cost of an IAC is from 1 to 3 percent of the cost of the R&D effort itself. Two percent provides sufficient funds so that information acquisition, processing, analysis, and dissemination is literally on a current basis. One percent permits a significant contribution but only in selected areas.

Some examples:

If there are 200 scientists and engineers devoted to R&D with a particular mission - such as a part of pollution - the in takes the equivalent of 2 to obtain and synthesize selected areas of the knowledge - and 4 to really stay on top of it all.

Things to remember

Obtaining funding for IAC's is more difficult than one at first concludes.

IAC's are expensive - but nevertheless the trend is toward more and more centers where the need for progress is real.

Management will fund IAC's if the scientists and engineers who need the center clearly indicate what a center is and does - and cost it realistically.

UN CENTRE DE DOCUMENTATION SPECIALISE

SON ORGANISATION - SES METHODES - SON EFFICACITE

Y. J. Roeper

Chef de la Documentation
Société Nationale Industrielle Aérospatiale
Division Systèmes Balistiques et Spatiaux

RESUME

Après un bref rappel de la situation du Service dans l' entreprise et du déroulement de la chaine documentaire, on examine l' automatisation: les raisons qui y ont amené, l' établissement et la structuration du thésaurus, le traitement de l' information documentaire. On insiste sur la nécessité pour un centre spécialisé de constituer un réseau de traitement et d' appartenir lui-même à un réseau extérieur pour une meilleure rentabilité. On termine par quelques chiffres sur le prix de revient de la documentation automatique.

SUMMARY

After a brief description of the place occupied and the part played by the Service within the firm, and of the operating procedure of the documentation chain, its automatization is discussed: the reasons which led to it, the creation and structural organization of the thesaurus, documentary data processing. The necessity for a specialized centre to set up a processing network and to belong itself to an outside network for better cost-effectiveness is emphasized. Finally, a few figures are provided to illustrate the cost of automatic documentation.

UN CENTRE DE DOCUMENTATION SPECIALISE
SON ORGANISATION - SES METHODES - SON EFFICACITE

Y. J. Roeper

1. SITUATION DANS LA SOCIETE

La Société Nationale Industrielle AEROSPATIALE est née le 1er janvier 1970 de la fusion de Sud-Aviation, Nord-Aviation et SEREB. Elle a un capital de 400 millions de francs, un chiffre d'affaires de 3 milliards de francs, des effectifs de 42 000 personnes. Ses activités couvrent :
- les avions militaires et commerciaux
- les hélicoptères
- les engins tactiques
- les systèmes balistiques et spatiaux.

Cette dernière activité relève de la Division des Systèmes Balistiques et Spatiaux qui regroupe cinq établissements, deux qui formaient l'ancienne SEREB, deux provenant de Sud-Aviation et un provenant de Nord-Aviation, trois d'entre eux sont situés dans la région parisienne, un à Cannes, un autre en Aquitaine.

Cette Division assure la maitrise d'oeuvre des deux systèmes balistiques de défense par dissuasion SSBS et MSBS. Elle est également chargée de la conception et de la production de systèmes de lanceurs spatiaux et de satellites.

C'est l'ancien service de documentation de la SEREB qui a été chargé d'assurer la documentation et l'information au niveau de la Division, en liaison avec des correspondants dans les Etablissements.

2. ROLE

Le rôle fondamental n'a pas été modifié par la formation de l'AEROSPATIALE, seules les modalités de fonctionnement ont dû être adaptées aux Etablissements et un réseau documentaire est mis progressivement sur pied.

Le fonctionnement de base est classique :
- acquisition et stockage des documents eux-mêmes,
- stockage de l'information contenue dans les documents,
- restitution de cette information (fig. 1)

Les matériaux documentaires sont de deux sortes :
- les documents externes soit sous forme primaire, c'est-à-dire les livres, les rapports d'organismes tels que la NASA, l'AIAA, les articles de revues sélectionnés par nos soins, soit sous forme secondaire, c'est-à-dire en provenance de bulletins de résumés, comme celui du CEDOCAR, les USGRDR, etc.
- les documents internes, c'est-à-dire les notes techniques émises et reçues au titre des programmes qui sont du ressort de la Division.

Parallèlement, le service de documentation examine les documents, sélectionne ceux qui sont intéressants et stocke l'information qu'ils contiennent, constituant ainsi fichiers et dossiers.

La restitution des informations stockées se fait de deux façons :
- systématiquement, par des bulletins, comme le bulletin bibliographique et le bulletin "Informations Engins Espace". Il s'agit là d'une documentation permanente.
- à la demande, en répondant par recherche rétrospective à des questions spécifiques posées par les utilisateurs. La réponse est soit une liste bibliographique vérifiée, soit une synthèse documentaire.

On voit sur la partie droite de la figure les niveaux auxquels l'ordinateur peut intervenir :
- stockage de l'information sur disques et bandes magnétiques, cette information étant aussi bien des données bibliographiques que des mots-clés décrivant le contenu des documents,
- restitution de l'information sous forme de fichiers (auteurs, organismes), de bulletins bibliographiques et de recherches documentaires.

Nous nous bornerons dans cet exposé à l'aspect automatisation de la documentation.

3. AUTOMATISATION

Quand nous avons décidé d'automatiser notre documentation, nous avions un fichier manuel de 70 000 documents indexés au moyen de la Classification Décimale Astronautique (fig. 2).
Il s'agit d'un plan de classement en 10 chapitres, divisés chacun en 10 classes, eux-mêmes subdivisés en 10 groupes. (1 000 rubriques au total)

Thésaurus

Ce fichier a servi à l'établissement du thésaurus. Nous l'avons traité rubrique par rubrique, mais en regroupant les rubriques par grands domaines d'activités, même si elles étaient dispersées dans des chapitres différents, celà afin d'éviter de construire le thésaurus en fonction du plan de classement.

Chaque fiche du fichier classique comportant un résumé, il suffisait de l'analyser pour en extraire les descripteurs, puis à mesure que l'on avançait dans le traitement de la rubrique, d'établir les relations sémantiques qui s'imposaient.

En passant ensuite aux différentes rubriques d'un même domaine, on pouvait établir le thésaurus de proche en proche.

A mesure que le vocabulaire d'un chapitre se développait, nous cherchions le fil directeur des liaisons à établir entre les différents termes, à l'aide de graphiques illustrant l'organisation sémantique des descripteurs du domaine considéré. Ces schémas directeurs présentent l'avantage de visualiser un grand nombre de liaisons sous un volume réduit, ils sont une base de départ claire. Ces représentations ne sont pas figées et lors de l'évolution du vocabulaire, les termes nouveaux peuvent être facilement situés dans ce cadre (fig. 3).

Cette méthode séquentielle présente plusieurs avantages :
- notre fichier reflétant tous les domaines d'intérêt de la SEREB, nous étions sûrs d'extraire tous les descripteurs qui nous intéressaient et uniquement ceux-là,
- le choix du degré de finesse des descripteurs était dicté par le volume des fiches à traiter,
- homonymie, synonymie, polysémie apparaissaient immédiatement, qu'elles soient dues à des évolutions du langage ou à des terminologies différentes suivant les auteurs,
- il était possible de traiter un nombre important de fiches avec un nombre réduit de documents.
  En effet, lorsqu'une rubrique n'apportait plus de descripteurs nouveaux depuis un certain temps, il suffisait de regarder rapidement les fiches restantes et de traiter uniquement celles qui apportaient des idées nouvelles,
- la pertinence était nettement améliorée, car on dépistait facilement, au moment de l'établissement du thésaurus, les documents traitant du même sujet qui étaient analysés par des descripteurs différents et on pouvait introduire immédiatement les relations sémantiques qui évitaient que pareil cas puisse se reproduire.

Le thésaurus comprend actuellement 8 000 termes et 12 000 liaisons.

Indexation des documents - Langage documentaire

L'indexation est l'expression du contenu des documents au moyen de descripteurs (noms et adjectifs) avec ou sans indication de relation logique entre ces mots. L'indexeur relève dans le titre et le résumé les mots, expressions, syntagmes (*) qui semblent importants et les transcrit du langage naturel en langage documentaire. L'indexeur doit utiliser l'acquis linguistique déjà constitué. Les termes choisis doivent être d'usage courant et refléter au maximum le langage naturel; de plus, ils doivent être spécifiques et précis.

Les syntagmes permettent :
- de préciser les sens de termes vagues comme analyse, en donnant leur domaine d'application : analyse chimique, analyse mathématique,
- d'éliminer des ambiguités du type : <u>mécanique</u> rationnelle, vibration <u>mécanique</u> qui se trouvent distinguées (nom et adjectif étant écrits différemment),
- de donner un embryon de syntaxe.
  Conventionnellement, nous avons appelé nom le premier terme, dit encore gouverneur, et adjectifs, les arguments qui le caractérisent.

Présentation des données

Etablissement des bordereaux :

Pour chaque document, l'indexeur écrit un bordereau (fig. 4) dans lequel il indique les descripteurs et les liaisons de hiérarchie, de synonymie, ou autres que lui suggère le document. Ces bordereaux sont ensuite transformés en cartes perforées qui sont converties en une bande "documents" d'où découle tout le traitement ultérieur.

Listes fournies :

Des programmes appropriés permettent d'imprimer trois listes :
- une liste "documents" qui est la copie des bordereaux (fig. 5),
- une liste "lexique" qui donne le dictionnaire des descripteurs employés avec leur fréquence d'utilisation et le numéro des documents dans lesquels ils apparaissent (fig. 6),
- une liste "thésaurus" qui donne, en plus des descripteurs du "lexique", les liaisons sémantiques entre les termes (fig. 7).

(*) Nous nous sommes bornés à des syntagmes élémentaires du type nom-adjectif.

Recherche documentaire

La question à traiter est exposée en langage naturel, on s'efforce de mettre en évidence et de classer par ordre d'importance les divers arguments. La question est ensuite traduite en langage documentaire à l'aide du thésaurus, le choix des mots et des syntagmes étant fait en fonction des liaisons entre les termes et des fréquences d'apparition dans les documents enregistrés dans le fond documentaire.

Les fréquences d'apparition permettent d'apprécier a priori le facteur de résolution (nombre de documents retrouvés) maximum de la question posée.

Exemple

- Question posée en langage naturel : Sécurité des allumeurs électriques

Mots primaires tirés de la question : sécurité
allumeur électrique

Mots secondaires tirés du thésaurus :

- sécurité	accident danger explosion incendie protection
- allumeur	allumage
- allumage	allumeur amorce
- allumage électrique	allumage étincelle bougie

- Question posée en langage documentaire :

[(sécurité ou accident ou danger ou explosion ou incendie ou protection) et (allumage électrique ou allumeur électrique ou allumage étincelle ou amorce ou bougie)]

Codée, la question devient (fig. 8) :
6ème Q. [(A 6592 + A 1846 + A 3399 + A 4029 + A 4592 + A 6136) * (A 2129 + A 2121 + A 2178 + A 2122 + A 2621)]

La réponse apparaît sous forme de numéros de documents : (fig. 9). Les questions peuvent également être écrites en clair et être décodées par l'ordinateur, il est également possible de donner la réponse sous forme de bibliographie complète au lieu de numéros de documents.

Ordinateur

Les programmes écrits en FORTRAN ont été mis au point sur un ordinateur IBM 7040, ils ont été adaptés ensuite à un IBM 360-65 à 512 K avec une LCS (low core storage), 6 armoires de bandes à 9 pistes - 60 KHz, des dispositifs à accès direct constitués de 8 volumes de 30 millions de caractères chacun (2314).

Du fait que les programmes sont écrits en FORTRAN et qu'ils sont modulaires, ils peuvent être adaptés à tout matériel ayant un compilateur FORTRAN G et une taille de mémoire supérieure à 64 K. C'est ainsi que le traitement d'un lot partiel de documents et la recherche documentaire peuvent également être effectués sur l'IBM 360-30 à 64 K de l'Aquitaine, nous envisageons de procéder de la même façon avec le CII 10070 de Cannes; dans un souci d'homogénéité et de centralisation des données, la mise à jour des fichiers globaux est effectuée sur l'IBM 360-65 de la Région Parisienne.

4. ORGANISATION DU RESEAU DOCUMENTAIRE

A l'intérieur de la Division, le réseau comprend un Service Central dans la région parisienne qui définit la politique documentaire, met au point les méthodes de traitement, joue un rôle de coordination et des correspondants d'établissements qui assurent les besoins locaux; le travail d'analyse des documents est réparti, des fichiers partiels sont créés localement, des réunions de révision du thésaurus ont lieu périodiquement.

En ce qui concerne les documents internes, c'est-à-dire les notes techniques rédigées par la Division ou par ses coopérants, les correspondants d'établissements assurent principalement un rôle de centralisation, les rédacteurs de notes fournissant un résumé d'auteur accompagné de descripteurs; en fait, les notes techniques sont précédées d'une page de garde du type de celle établie par le COSATI, aux Etats-Unis.

A l'extérieur de la Division, le service de documentation collabore avec le CEDOCAR, ce qui lui permet par l'intermédiaire d'un réseau national, de faire servir le travail qu'il effectue à l'ensemble de la profession missiles-espace, en même temps qu'il profite lui-même du potentiel de cet organisme.

5. PRIX DE LA DOCUMENTATION AUTOMATIQUE

Pour un centre spécialisé d'une société industrielle, comme le nôtre, traitant un nombre relativement faible de documents (de l'ordre de 15 000 par an), le problème de la rentabilité est particulièrement important.

Des études statistiques d'exploitation ont montré que pour ce nombre de documents et environ 1300 recherches par an, la documentation automatique coûtait approximativement 500 000 F/an. Si l'on devaittraiter le même volume en documentation classique, le coût serait sensiblement le même.

Considéré par rapport aux effectifs de la Division, le coût correspond à un prix de revient de :
- 450 F. par ingénieur de la Division et par an pour la documentation automatique seule
- 900 F/an toutes dépenses confondues, c'est-à-dire personnel complet du service, achats de documents, abonnements, automatisation.

6. CONCLUSION

Nous pensons que le centre spécialisé, bien placé pour connaitre les besoins des utilisateurs, a son rôle à jouer à condition qu'il évite la duplication avec les grands centres de documentation, qu'il se limite aux questions spécifiques pour lesquelles il est particulièrement compétent et qu'il apporte sa collaboration aux grands centres dans les domaines qui tout en lui étant propres, présentent un intérêt suffisamment général. Il doit également avoir un souci de compatibilité dans la présentation des données et dans le choix des méthodes de traitement.

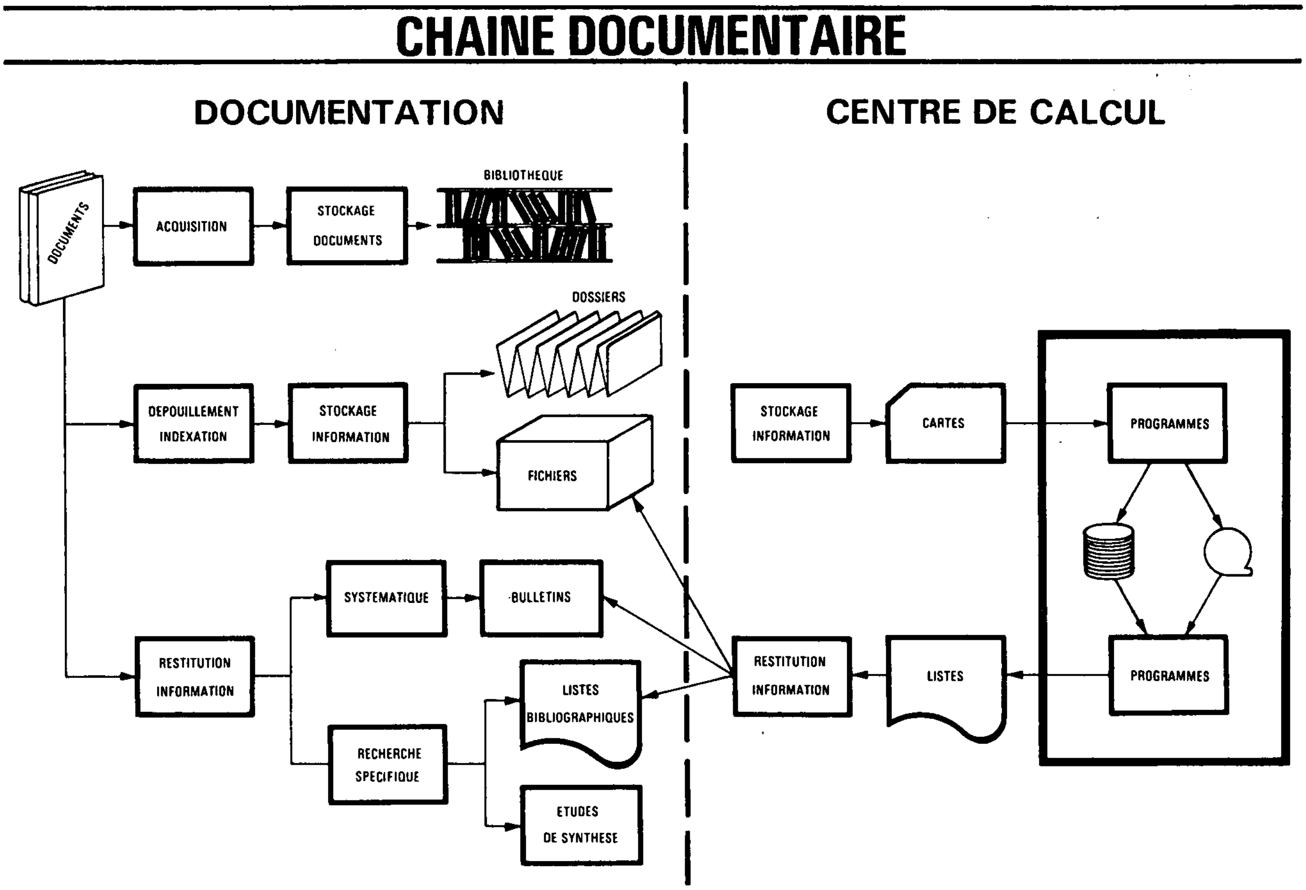


FIGURE 1

Exemple de la "Classification Décimale Astronautique"

54 - Eléments de guidage et de contrôle

540 - Dispositif de mesure de l'angle d'incidence
541 - Systèmes à volants
542 - Dispositifs de chronométrage et de programmation
543 - Eléments de poursuite
544 - Antennes
545 - Dispositifs de sécurité et de destruction
546 -
547 -
548 - Vérins, servomécanismes
549 - Divers

55 - Réseau et sources d'énergie

550 - Généralités
551 - Câbles et distributeurs électriques
552 - Batteries et piles à combustibles
553 - Motrices, génératrices et convertisseurs
554 - Groupes auxiliaires de puissance
555 - Générateurs solaires
556 - Générateurs nucléaires
557 -
558 -
559 - Divers

FIGURE 2

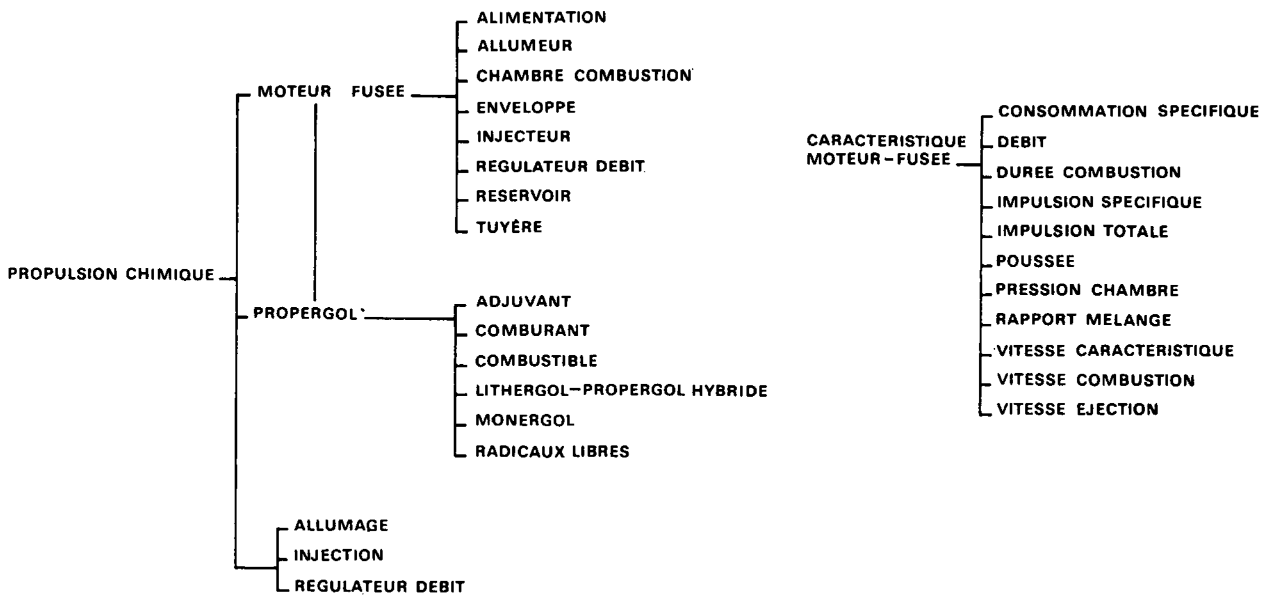
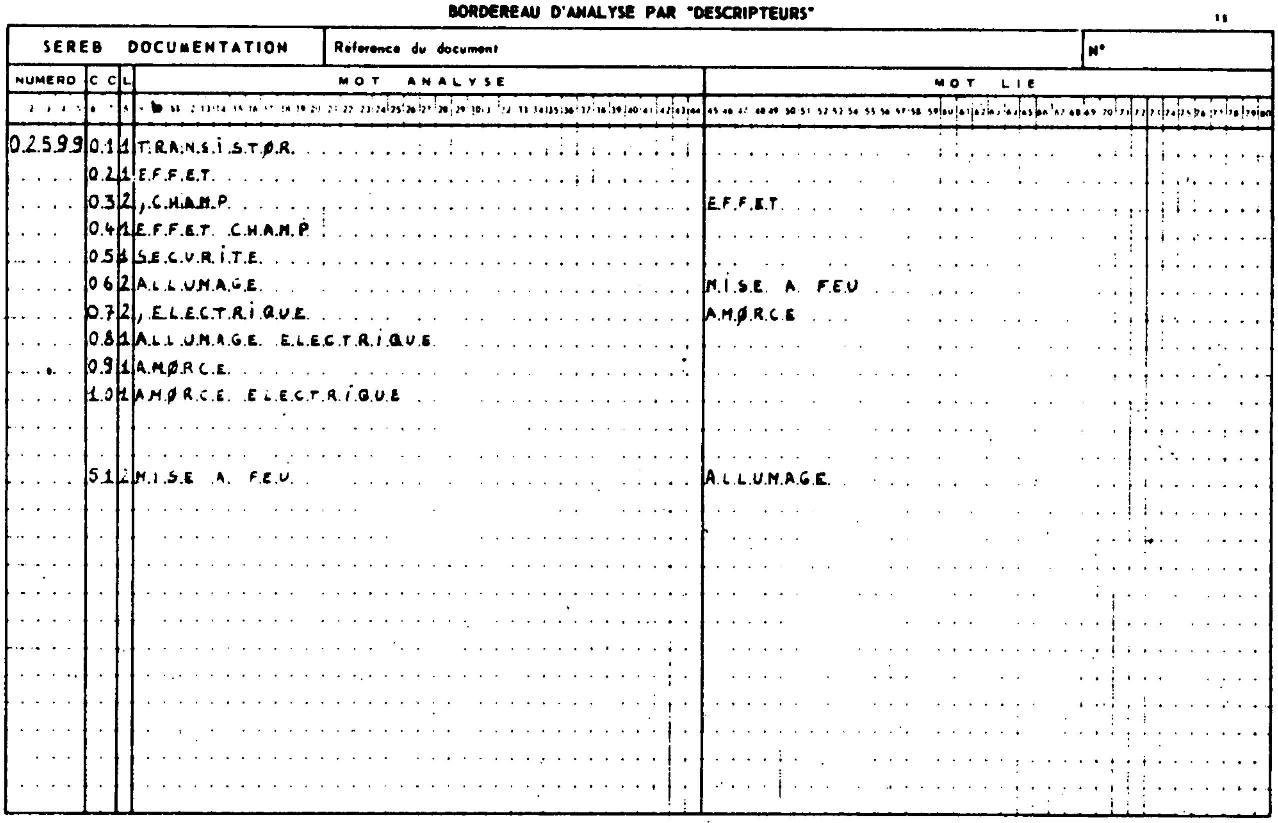


FIGURE 3


BORDEREAU D'ANALYSE PAR "DESCRIPTEURS"

SEREB DOCUMENTATION — Référence du document — N°

NUMERO	C	C	L	MOT ANALYSE	MOT LIE
0.2599	0	1	1	TRANSISTØR	
	0	2	1	EFFET	
	0	3	2	,CHAMP	EFFET
	0	4	1	EFFET CHAMP	
	0	5	1	SECURITE	
	0	6	2	ALLUMAGE	MISE A FEU
	0	7	2	,ELECTRIQUE	AMØRCE
	0	8	1	ALLUMAGE ELECTRIQUE	
	0	9	1	AMØRCE	
	1	0	1	AMØRCE ELECTRIQUE	
	5	1	2	MISE A FEU	ALLUMAGE

FIGURE 4

	7	1	ECHANGE	
	8	1	HUMICITE	

LISTE PAR DOCUMENTS

2597	1	1	VITESSE	
	2	1	DETONATICN	
	3	1	ACIDE	
	4	2	,AZOTHYDRIQUE	ACIDE
	5	2	ACIDE AZOTHYDRIQUE	AZOTE
	6	2	,LIQUIDE	ACIDE AZOTHYDRIQUE
	7	1	ACIDE AZOTHYDRIQUE LIQUIDE	
	51	2	AZOTE	ACIDE AZOTHYDRIQUE
	52	2	ACIDE AZOTHYDRIQUE	EXPLOSIF
	53	2	EXPLOSIF	ACIDE AZOTHYDRIQUE
2598	1	1	ESSAI	
	2	1	,MECANIQUE	
	3	2	,PYROTECHNIQUE	ESSAI
	4	1	ESSAI MECANIQUE	
	5	1	ESSAI PYROTECHNIQUE	
	6	1	BOULON	
	7	2	,EXPLOSIF	BOULON
	8	1	BOULON EXPLOSIF	
	9	1	PYROMECA	
	10	2	VERONIQUE	MISSILE
	11	2	VESTA	MISSILE
	51	2	MISSILE	VERONIQUE
	52	2	MISSILE	VESTA
3599	1	1	TRANSISTOR	
	2	1	EFFET	
	3	2	,CHAMP	EFFET
	4	1	EFFET CHAMP	
	5	1	SECURITE	
	6	2	ALLUMAGE	MISE A FEU
	7	2	,ELECTRIQUE	AMORCE
	8	1	ALLUMAGE ELECTRIQUE	
	9	1	AMORCE	
	10	1	AMORCE ELECTRIQUE	
	51	2	MISE A FEU	ALLUMAGE
2600	1	1	DETONATEUR	

FIGURE 5

LEXIQUE

			2194	2233	2293	2310	2314	2322	2364	2368	2374	2389
			2390	2512	2513	2517	2518	2519	2520	2522	2623	2524
			2526	2527	2574	2576	2586	2595	2599	2617	3278	3288
1	A2119	ALLUMAGE CATALYTIQUE	2520									
1	A2120	ALLUMAGE CHOC	2524									
5	A2121	ALLUMAGE ELECTRIQUE	2519	2520	2523	2574	2599					
1	A2221	ALLUMAGE ETINCELLE	2517									
6	A2123	ALLUMAGE HYPERGOLIQUE	2101	2310	2390	2520	2522	2527				
1	A2124	ALLUMAGE MULTIPLE	2512									
1	A2125	ALLUMAGE NON PYROTECHNIQUE	2520									
3	A2126	ALLUMAGE PYROTECHNIQUE	2518	2520	2595							
2	A2127	ALLUMAGE REPETE	2520	2523								
7	A2128	ALLUMEUR	2071	2072	2520	2521	2523	2527	2593			
1	A2129	ALLUMEUR ELECTRIQUE	2593									
2	A2130	ALMAG 35	3340	3833								
1	A2131	ALNICO	3467									
1	A2132	ALOUETTE	5484									
1	A2133	ALOUETTE 001	5484									
1	A2134	ALOUETTE 002	5484									
57	A2135	ALTITUDE	31	59	70	72	80	81	105	127	146	167
			179	182	205	207	208	245	260	285	289	290
			291	293	510	612	733	755	756	758	777	813
			816	821	860	868	1083	1087	1090	1178	1308	1462
			1507	1522	1567	1576	2470	2471	2478	2483	2488	2491
			2949	3047	5081	5140	5143	5158	5175			
3	A2136	ALTITUDE BASSE	612	1576	5140							
5	A2137	ALTITUDE ELEVEE	31	179	510	1567	2949					
24	A2138	ALUMINE	3267	3281	3300	3309	3339	3751	3778	3977	4090	4169
			4185	4192	4193	4194	4198	4206	4239	4254	4276	4292
			4297	4303	4306	4497						

FIGURE 6

EXTRAIT DU THESAURUS

```
                T8
                VT
                230
 9      ALLIAGE TITANE ALUMINIUM
                A-110AT
                C-120AV
                ICI 318 A
                IMI 317
                IMI 318 A
                TA4M
                TA6V
                U TA6V
                130
                317
                318 A
 1      ALLIAGE TITANE ALUMINIUM ETAIN
 1      ALLIAGE TITANE ALUMINIUM MOLYBDENE
                TA8DV
 1      ALLIAGE TITANE ALUMINIUM ZIRCONIUM
 1      ALLIAGE TITANE CHROME
 1      ALLIAGE TITANE CHROME SILICIUM
 2      ALLIAGE TITANE NIOBIUM
 1      ALLIAGE TITANE VANADIUM
 1      ALLIAGE TITANE VANADIUM BERYLLIUM
 1      ALLIAGE TITANE ZIRCONIUM BERYLLIUM
10      ALLIAGE TUNGSTENE
 3      ALLIAGE ZIRCONIUM
               ZIRCALOY 2
 1      ALLISON
 1      ALLOCATION
 4      ALLONGEMENT
40      ALLUMAGE
               ALLUMEUR
               AMORCE
               EXPLOSION
               INFLAMMATION
               MISE A FEU
               PROPAGATION FLAMME
               PROPULSION CHIMIQUE
               REALLUMAGE
```

FIGURE 7

EQUATION DE RECHERCHE

QUESTIONS
+++++++++

```
 1        (((A1926 • A2564) + A2565) • A6071)

 2        ((A4050 + A4938 + A5990 + A6028 + A6269 + A2892 + A3120 + A5255
 2   1      + A4045 + A4212 - A3313) • A6071)

 3        (((A7289 . A2843) + A7290 + A3199 + A3544 + A3657
 3   1      + (A4166 • A2843) + A4171 + A6336) • (A2564 + A6071) . A5655)

 4        (A5870 • A5889)

 5        (A6368 • (A5242 + A6056 + A6116 + A6397))

 6        ((A6592 + A1846 + A3399 + A4029 + A4592 + A6588) • (A2129 + A2121
 6   1      + A2122 + A2621))

 7        ((A1928 + A4808) • ((A2742 • A5242) + (A3622 • A3049) + 4584
 7   1      • A4588 + A7523 + (A7520 • A3049)) • A6073)

 8        ((A4212 + A2010 + A2958 + A3428 + A3767 + A3795 + A4165 + A4241
 8   1      + A4262 + A5255 + A5768 + A7009 + A7197) • A2517)

 9        ((A2355 + A6743) • (A3854 + A5242))

10        ((A3293 + ((A3286 + A3913 + A5532) • (A2386 + A2640)))
10   1      • A2055 + A4954 + A6171 + A5317))
```

FIGURE 8

REPONSE DE L'ORDINATEUR

REPONSES
++++++++

QUESTION	NUMEROS DE DOCUMENTS									
1	116	2104	2107	2117	2124	2126	2130	2132	2136	2140
	2160	2179								
2	305	2014	2065	2075	2079	2083	2084	2087	2093	2110
	2127	2128	2177	2181	2186	2405	2406			
3	2117	2132	2144							
4	2113									
5	473	732	2385	2497	2530	3010				
6	2519	2599								
7	2175									
8	3178	3361	3362	3370	3376	3382	3396	3430	3443	3450
	3454	3508								
9	2549	3525	3528	3568	3569	4645				
10	3557	3559								

FIGURE 9

THE HARWELL HEAT TRANSFER AND FLUID FLOW INFORMATION ANALYSIS CENTRE

by

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SUMMARY

This paper describes a service which has been established to meet the information requirements of a specific group of scientists and technologists. Some particulars of one of the Harwell industrial service and consultancy projects are given and the methods employed by this group to handle the information. It describes the setting up of a reference library for the heat transfer and fluid flow literature and the methods for rapid retrieval of that literature using the large digital computer at Harwell.

RESUMÉ

Cette communication décrit un service etabli pour satisfaire les besoins documentaires d'un groupe spécialiste de savants et technologues. Elle donne des précisions sur un des services de conseil à l'industrie qui sont établis à Harwell, et sur les méthodes de traitement d'informations qui y appartiennent. On décrit l'institution d'une bibliothèque de consultation pour la littérature du transfert de chaleur et des écoulements fluides, et les méthodes de recouvrement de ces informations, qui utilisent le grand calculateur numérique de Harwell.

1. Introduction

The vast growth of science and technology in recent years has inevitably produced a corresponding increase in information and with it problems of retrieval and storage of this information. It is, therefore, almost impossible for the individual scientist or technologist to keep abreast of developments in areas which are closely allied to his own interests.

A solution to the information retrieval and storage problem is to build a service which is tailored to meet the requirements of a particular group of specialists. Several information analysis centres of this type have been established within the U.K.A.E.A. These services have a number of functions, the main ones being:

(i) To put individuals in industrial organisations in contact with engineers and scientists with experience in a particular field.

(ii) To make them aware of recent literature which covers their interests.

(iii) From the information files to provide a detailed retrospective analysis and survey of the information relating to specific problems.

2. The Heat Transfer and Fluid Flow Service

A survey was made, during 1966 and 1967, to determine industry's requirements for information, research and development in the field of heat transfer and fluid flow. The U.K.A.E.A. had gained a great deal of knowledge in this field as a result of the research that had been carried out for the nuclear reactors. Particular attention was paid to the contractors and operators of chemical and process plant and to the manufacturers of heat exchangers and boilers in Britain.

As a result of this exercise the Heat Transfer and Fluid Flow Service (H.T.F.S.) was created in June 1968 with the support of the Ministry of Technology. It is centred in the Chemical Engineering Division at Harwell and provides two types of service. The first is the Subscription Information Service which in return for a set fee per annum a company receives:

(1) At least six Design Reports on various parts of engineering plant per annum. These Reports give the information in easily accessible form and include computer programs where appropriate.

(2) An Information Service which provides up-to-date information in the form of a monthly current awareness bulletin, an S.D.I. service and retrospective literature searches.

(3) Two days consultancy per annum.

(4) Reports on general research work carried out by H.T.F.S.

The second service provided by H.T.F.S. is a confidential contract service.

H.T.F.S. is administered from Harwell but extensive use is made of the resources of other U.K.A.E.A. Laboratories and the National Engineering Laboratory at East Kilbride. The program of Design Reports is decided by a panel, made up of the representatives of each subscribing company and members of H.T.F.S., which meets two to three times per annum. The panel also receives reports on the research programme and other topics of interest to the industry.

3. The H.T.F.S. Information Section

The purpose of this paper is not to describe H.T.F.S. as a whole but the collection and handling of the information before it is comprehensively analysed in the Design Reports. It is the duty of this information section to meet the information needs of H.T.F.S. and other U.K.A.E.A. personnel, in addition to meeting similar needs for the industrial subscribers to H.T.F.S.

All the computer programs used for retrieving the information have been written by a member of the Process Technology Division at Harwell, who wrote them with the specific purpose of retrieving the literature held by the members of his Group. The programs have been adapted to cater for the much larger quantity of literature held by the Heat Transfer and Fluid Flow Group. The only real difference between the two systems is that the keywords are different. The programs are commonly used by both groups although, as the data sets are quite different, they are therefore stored quite separately within the computer. These computer programs could be used just as well for the retrieval of other literature provided that it has been indexed in a manner similar to that described in this paper.

4. Collecting and Storing the Literature

Due to the fact that there is no source which adequately covers and retrieves the world literature on heat transfer and fluid flow it was decided that H.T.F.S. would set up their own reference library. No set of abstract journals does this and, of those that do cover some parts of it, many are often a year or more out of date; also, the report literature is very poorly served. This reference library would primarily hold, in some form or other, all the relevant literature which came into its possession.

At the time of writing, over 11000 documents are in store; more than 90% of these are complete copies of journal articles, microfiche, books, reports etc., and the rest are abstracts of articles which are only of fringe interest and which are easily obtainable from one of the scientific libraries in the U.K. Most of these documents are taken from scientific literature written in the last 10 to 15 years, although copies of certain important papers written before 1955 are held in the H.T.F.S. Library. This store is added to at a rate of 150 to 200 items per month. Many of these additions are current publications, obtained by daily scanning of all the literature taken by the main Harwell Library. The scanning of this literature is carried out by the H.T.F.S. Information Office staff and therefore eliminates the necessity for each scientist within the group to scan the published literature in order to extract information for work in which he is currently engaged.

An essential feature of the H.T.F.S. Information Service is that it is near a large scientific library, which has such excellent facilities. The main Harwell library has an annual intake of over 2000 different journals, a large number of reports, microfiche and many abstracting publications.

Some of the current literature is also obtained from other sources, which includes the Group's many contacts with other home and overseas organisations. A flow diagram of the acquisition of this information is shown in figure 1.

The recent additions to the H.T.F.S. library are listed in the current awareness bulletin "H.T.F.S. Digest" which is collated and produced monthly. This publication is then distributed to subscribers to H.T.F.S. and to personnel in the U.K.A.E.A. who have similar interests. Individuals are notified separately by postcard of publications which are directly relevant to their work.

Publications are also found by the retrospective searching of the abstracting journals, the U.D.C. files in the main Harwell Library and other sources, in order to answer specific enquiries for information, which is not already in the H.T.F.S. library. All this additional information is added to the store.

5. Processing of Documents

When the documents are received the full bibliographic details of each item are recorded on the front of a special form by one of the clerical staff in the information section. One of these forms is assigned to each document. If only the abstract of a paper is held then it is attached to the front of this form. The back of the form lists all the keywords which are currently in use.

Each document is then scanned, analysed and its whole contents indexed, by a member of the scientific staff, who rings the relevant keywords. Our interpretation of each keyword is given in the thesaurus, which has been compiled as a result of discussions between various members of the Group.

The thesaurus lists the keywords currently used by H.T.F.S. The current list has evolved as personnel in the section have gained experience in indexing and retrieval of the heat transfer and fluid flow literature. The original list composed in 1967 contained 140 terms and was, as expected, biased toward the two-phase gas liquid heat transfer and flow literature, because before that time the Group was mainly involved in basic research on water-cooled reactors. Since 1967 the number of keywords has risen to 209 to cover other aspects of heat transfer and fluid flow and to make some of the original vague terms more specific. Many of the documents indexed using the original list have been re-indexed where necessary so that they are covered by the new keywords.

The object of indexing is to achieve rapid retrieval of information. Therefore an article must contain specific information about a term before an indexing term to the subject is assigned. For example, if a document merely mentions that the results were analysed by the use of a computer program it does not warrant to be indexed with the term COMPUTER PROGRAM. This term should only be used if a specific program is described.

As a general guide for keywording the heat transfer and fluid flow literature the indexer should endeavour to answer the questions:

(i) What is the main content of this paper?

(ii) What conditions were attained?

(iii) What data is given?

(iv) Are specific techniques of measurement described?

(v) What form is the document?

(vi) What substances were used?

(vii) What geometry was used?

(viii) Does it describe a particular piece of equipment?

(ix) Does it give any physical property data?

(x) Is it worth retaining?

(xi) Can the document be easily retrieved by the keywords ascribed to it or will it be lost in a large system?

Obviously all these questions will not be answered for each document that is indexed, but they should be asked so that no important items are missed. The object should be to assign to the document as much relevant information as possible, without overdoing it, so that the paper can be retrieved in the future in preparing reviews, design reports, or answering information enquiries.

No specific rules can be set as to the number of terms that should be used per document. In general, the more terms used, the more specific the information that can be retrieved. On average the number of terms usually found necessary to describe the paper adequately is between ten and fifteen. With some practice it is possible to index each document in an average time of 5 to 10 minutes. The scientific staff should put aside 1 hour per week per person to do this duty.

After indexing, the documents are returned to the clerical staff in the information office. Each document is given an accession number, assigned in numerical sequence, and they are filed in sequential order after the full bibliographic details have been recorded on computer cards. The information on these cards is stored within the computer. A print out of each reference is recorded in accession number order and other copies are used for author index cards as will be described below. A flow diagram of the processing of these documents is given in figure 2.

6. Storage and Retrieval of Information

Up to October 1968, feature cards were used, in conjunction with first author filing cards, for the retrieval of documents. However, the punching of these cards proved very time-consuming and great difficulty was encountered in keeping up to date with it.

6.1 Storage of keyword data on the computer

With the installation of the remote-link, multi-access terminals to the IBM 360/75 computer at Harwell, it was decided that this peek-a-boo keyword system could easily be transferred to the computer for filing and retrieval. As the computer is a digital type which uses FORTRAN language and because it is far easier and quicker to punch numbers than to punch keywords or abbreviations of keywords each of our keywords was given a keynumber. The indexing terms for all the documents then held by H.T.F.S. were punched on to 80-column computer cards within 25 working days. This was at least six times faster than the time taken to punch the same information on to feature cards.

The information was punched on to computer cards in formatless form, accession number followed by keyword numbers followed by -1 denoting the end of the case. It is then sorted by the computer to group together all the document numbers assigned to a particular keyword and it is stored on a direct access device in the computer in that form. A second version of this data set is copied on to magnetic tape for purposes of emergency. Updating of the keyword store is carried out fortnightly when the information of 100-150 documents is added via a teletype terminal. When a new set of information is stored on the computer a complete listing or, if required, a listing of only the changed keywords is given on a print-out from the line printer. This complete listing is particularly useful for retrieval purposes and also for cases where a keyword has been found to be too all-embracing and is replaced by other new keywords; only the documents originally given that keyword have to be changed.

A modified version of the STORE program has been written to enable small adjustments to be made to the data. The purpose of this is that document numbers can be added or removed from a particular keyword when the data is stored on a direct access device.

6.2 Retrieval of Document Numbers

Retrieval is carried out by a mechanised method which is very similar to the feature card method. A computer program has been written for transferring all the data associated with each required keyword to the central core and then sorting these numbers so that accession numbers common to all the inserted keywords for each case are printed out at a teletype terminal and at the line-printer in the computer centre. This program has been written to use less than 140 k bytes of store and to complete the job in as short a time as possible. The more keywords used in the retrieval of information the less documents are identified. Varying degrees of retrieval can be achieved by using different combinations of the subject keywords. Another facility of this program is that it is possible to eliminate unwanted documents by using negative keywords.

The output from the program gives a listing of the key numbers inserted into the program for that particular search and this is followed by a listing of the accession numbers of documents which were retrieved using those key numbers. This listing can also be used as data in a program described below for printing out the bibliographic details.

6.3 Assessment of documents retrieved

Now comes an important part of the retrieval of the documents for a particular enquiry - the assessment stage. No matter how accurately each document has been indexed some noise (i.e. some irrelevant information) will result from this form of retrieval due to the fact that many of the keywords have quite a wide usage and also due to occasional anomalies in the indexing of each document. To overcome this, each document is assessed for its relevance to that particular enquiry. This is a fairly easy task, although sometimes somewhat time consuming if a large number of documents are retrieved for a particular search. The task is considerably eased by the fact that all the literature is readily available in the H.T.F.S. library, as full documents or as abstracts. On average the relevance is about 40% but this depends entirely on the original enquiry and what keywords have to be used for retrieving the literature for that particular enquiry. For example, for literature pertaining to heat flux limitations in systems approaching the supercritical region, but not actually in that region, the keywords HEAT TRANSFER and SUPERCRITICAL would be used because near-critical systems should have been given the keyword SUPERCRITICAL. In the assessment stage all documents which only discuss the supercritical region would be eliminated leaving only those which deal with the near-critical region.

6.4 Storing bibliographic information in the computer

In addition to storing all the keywords in the form of numbers in the computer, the full bibliographic details of each document are also being stored separately. The only link between the keywords and the bibliographic information for each document is the accession number. This bibliographic information is recorded on a punch card or it can be added to a line file, via a teletype terminal in the following order: accession number, authors names, full title and the reference. A semicolon is used to separate the authors from the title and the title from the reference, and an asterisk is used as a continuation symbol from one card to the next. The title is recorded in upper and lower case; because there is no facility on the card punches for lower case, the symbol > (greater than) is used for entering lower case and the symbol < (less than) is used for entering upper case.

A program has been written for checking this information, which gives card output and a print-out via the line printer. The cards are somewhat different from the original cards in that they record the length, in bytes of each reference, thus eliminating the continuation symbol, and they are also punched in machine readable upper and lower case form. If the original information was correctly punched the information on these new cards is stored on a direct access device to the computer. A copy of this data set is held on magnetic tape for cases of emergency.

The width of the print out from this CHECK program can be varied from 20 to 72 columns depending on requirements. Usually several copies of each reference are obtained, one copy is held in the file, which lists all the information in order of accession numbers and the other copies are used for author index cards.

6.5 Retrieval of bibliographic information stored on computer

A program has been written for retrieval of this stored bibliographic information. To do this accession numbers are inserted as data into the program. A listing of this information is given at both the teletype terminal and at the line printer. Again, as in the CHECK program the width of the print-out can be varied from 20 to 72 columns. One of the main uses of this program is to give a typewritten list of the full bibliographic details of information retrieved as the result of a particular search carried out using keywords. This gives a considerable saving on typing and proof reading effort, particularly if a large number of references has to be sent to an enquirer. It is also very useful for providing a current list of accessions. Figure 3 shows a flow diagram of the information stored on the computer.

Once this bibliographic information has been stored there are obviously several other things that it can be used for. A program has just been written for sorting authors' names or corporate authors into alphabetical order. This would be used for producing an author index for a number of documents e.g. for producing a yearly index of the current awareness bulletin. Another program has been developed for author searches and for natural language searching and this can be used for producing KWIC indexes. It is our intention to produce eventually a master copy of the current awareness bulletin from a computer print-out and to produce a comprehensive annual index of the heat transfer and fluid flow literature.

7. Conclusions

This system for the handling and retrieval of specific information could be used equally well by other groups provided that keywords are used to index the literature. To do this, however, some time and effort must be put aside for indexing.

The large computer at Harwell is being used for the rapid retrieval of this information and the computer programs, outlined in this paper, have been written with efficiency and costs as prime considerations.

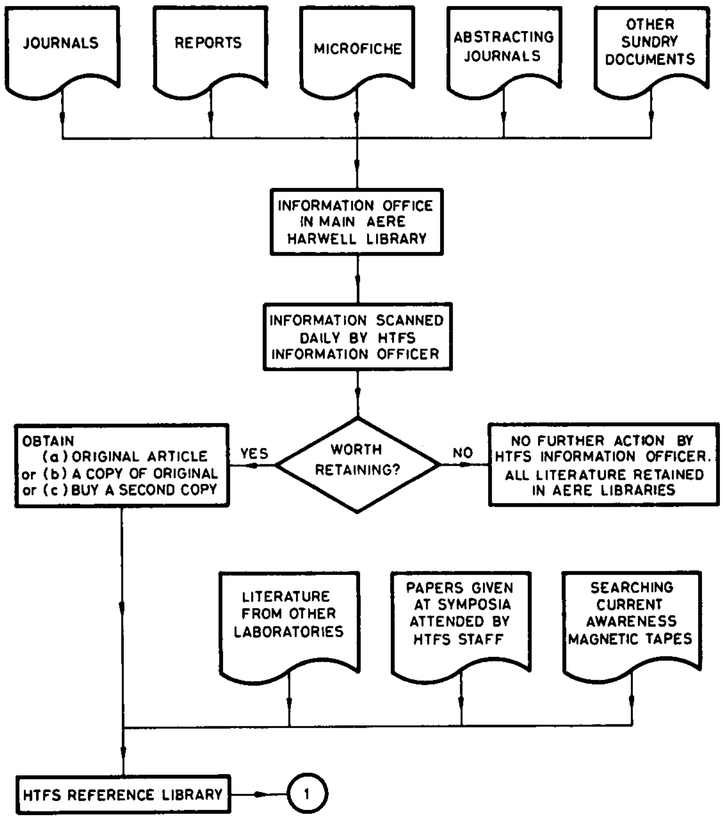

Figure 1 The Acquisition of Material for HTFS Library

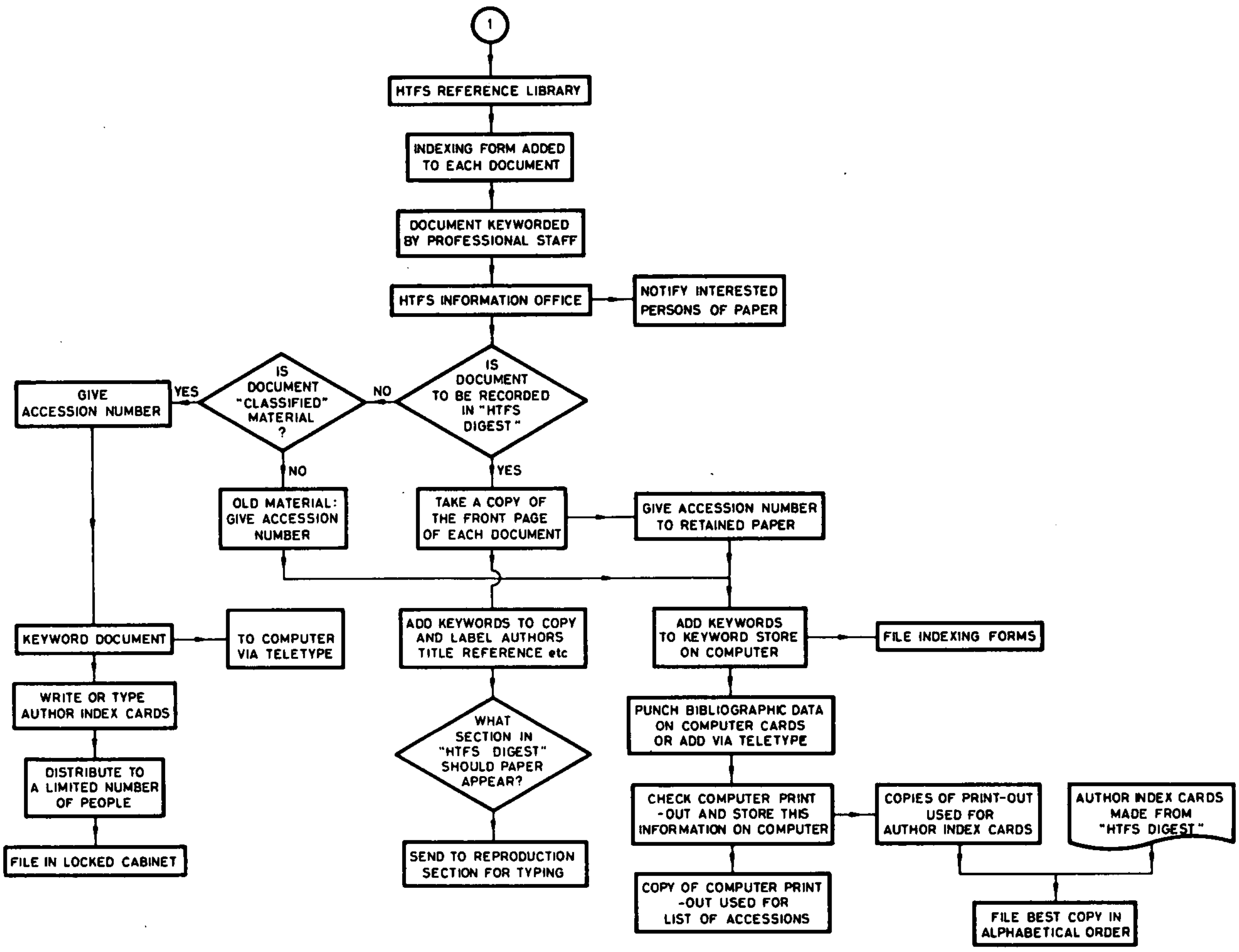

Figure 2 The Processing of Documents

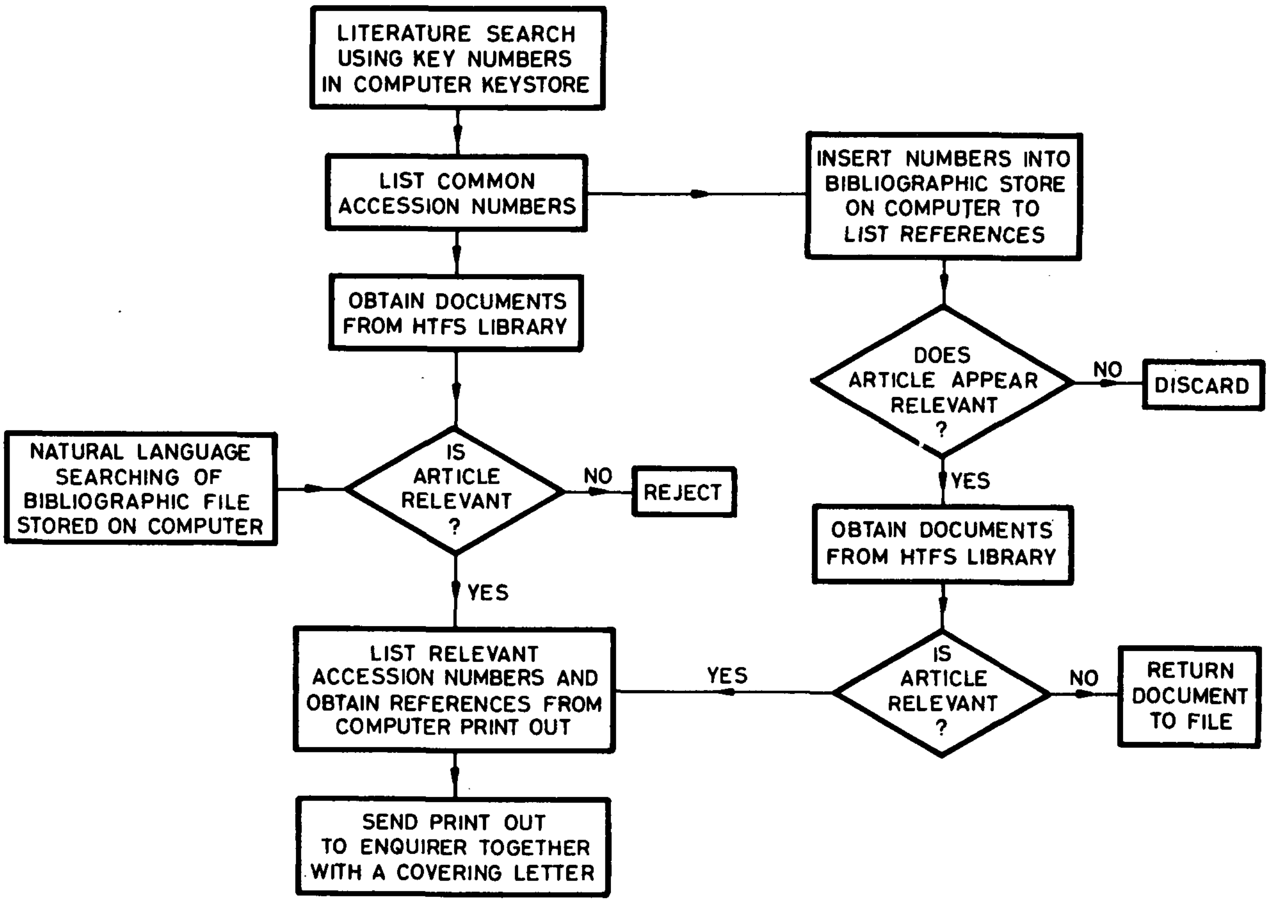

Figure 3 · Retrieval of Information using the Computer

PROPOSAL FOR AN INTERNATIONAL AIR POLLUTION INFORMATION ANALYSIS CENTER

by

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SUMMARY

The establishment within NATO of an international information analysis center on air pollution is proposed. The application of information analysis concepts to this critical field, which increasingly involves multidisciplinary research and development efforts in all the industrialized societies of the world, would create a comprehensive base of knowledge that would be utilized by (1) research scientists of many nations to assure maximum effective contributions to solving air pollution problems and (2) by administrators and policy makers to make the major decisions that determine what research is to be done and how it is to be funded. In suggesting one method of establishing the information analysis center, its organization and the functions of its international staff are described.

SOMMAIRE

On propose l'établissement dans l'OTAN d'un centre international d'analyse de l'information sur la pollution de l'air. L'application des concepts de l'analyse de l'information à ce domain critique, qui s'entraîne de plus en plus les efforts de la recherche et le developpment multidisciplinaire dans toutes les sociétés industrialisées du monde, créérait une base compréhensive de la connaissance qui serait utilisée par (1) les savants de recherche de plusieurs nations pour assurer au maximum les vraies contributions pour résoudre les problèmes de la pollution de l'air, et (2) par les administrateurs et les faiseurs de la politique pour faire les décisions majeures qui déterminent quelle recherche va être faite et comment on va la fonder. En suggérant une méthode pour établir le centre d'analyse de l'information, son organisation et les fonctions de son personnel international sont décrits.

PROPOSAL FOR AN INTERNATIONAL AIR POLLUTION INFORMATION ANALYSIS CENTER

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August, 1970

The opportunity is present to advance the state of the art in two areas of vital concern to our international society:

- Information analysis centers as a mechanism of management to accomplish international multidisciplinary research, and
- Air pollution as a subject in need of extensive coöperative effort by member countries of NATO.

As defined in a paper prepared for AGARD Lecture Series No. 44*, an analysis center is:

"An organization directed toward the collection of technical information and data in a specific area of effort and its evaluation and filtering into a form of condensed data, summaries, or state-of-the-art reports."

I propose that an International Air Pollution Information Analysis Center (IAPIAC) be established within NATO. In the following the concepts of information analysis center operations are applied to the subject of air pollution for your consideration.

Background

When ever there exists world-wide activity involving considerable research and development effort in a critical multidisciplinary topic, which is not significantly constrained by such factors as defense interest, there also exists a large quantity of internationally produced published literature and a number of specialized information services treating the literature. The body of primary published literature and the specialized secondary services that are established for its utilization operate essentially on a parochial basis. This parochialism compounds the problems of a researcher who must, if he is to make his maximum contribution, be able to ascertain who is doing what, and where. Administrators and policy makers are even more hampered than the researcher, for it is they who must make wise decisions on what research shall be done and how the funding for it is to be allocated.

The situation is compounded even more when one considers that, on an international basis, decisions must be made on many factors vital to effective air pollution research, such as

- Ambient air standards
- Emission standards
- Sampling and analytical methods
- Legal aspects
- Atmospheric reactions (particularly those occurring in one country caused by the pollutants from another)
- Economic losses
- Monitoring and measurements of the effects on plants, materials, animals, visibility, and health
- Planning and constructive restrictions involving international interactions.

All of these produce enormous amounts of published and unpublished literature and a plethora of data, standards, and regulations.

This situation is typical today in many fields and is an example of the "information explosion", a phrasing that could be looked upon simply as another cliché if it were not for the seriousness of the problem. The information analysis center provides the means of coping with this type of problem, and the number of centers is growing. They are demonstrating that they can, in fact, overcome the information explosion and can significantly improve the effectiveness of the decision-making process and thus the accomplishment of desired goals; in this case, an effective international clean air program.

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*G. S. Simpson, Jr. and J. W. Murdock, "Concept, Mission, and Operation of Scientific and Technical Information Analysis Centers," Paper prepared for AGARD Lecture Series No. 44 on Scientific and Technical Information, May 1970.

Essential Considerations

It must be emphasized that the proposed analysis center is not a documentation exchange program. Rather, it is a more sophisticated operation, one involving, on a part-time basis, air pollution experts of the several participating nations. The center would use to advantage existing documentation services and computer data programs, but in a highly selective and decentralized manner.

It would also establish for the use of all participating countries its own selective information collection, utilizing information and communication systems designed to satisfy both national and international interests. It would, for example, include a register of on-going research and development programs, air pollution laws and codes, a register of technologists and other key persons, and a referral service and network to specialized collections and data banks. It must be emphasized that these would all be auxiliary to the main function of the International Air Pollution Information Analysis Center -- namely, the analysis and compression of information necessary for the assurance of clean air.

Program Objectives

The objective of this proposal is two-dimensional in that it develops the concept of information analysis centers on an international basis and at the same time provides assistance in solving one of the critical problems of our time -- the control of air pollution. Some specific objectives of the IAPIAC would include the following:

(1) To provide the AGARD management and representatives of member countries the opportunity to observe the operation of a meaningful international information analysis center.

(2) To become a pertinent entity in both assessing and advancing science and technology and be potentially profitable to each country participant so that the center could become a permanent resource.

(3) To have such a value to the society of nations as to engender requests from non-NATO countries when the international environment improves. It is obvious that air pollution is truly a world-wide problem.

(4) To be capable of eventually accepting non-NATO members.

(5) To provide an ongoing international information, data, and communication operation which would clearly demonstrate the need for required and justifiable international standards for both information dissemination and pollution control.

(6) To provide authoritative and timely products of technical value to each participant nation so that the benefits of international cooperation in information and pollution problems can be demonstrated and appreciated.

(7) To serve as a resource on the basis of which Policy Groups can identify problems and develop plans and policies to overcome the problems.

(8) To provide member countries information representative of world-wide R&D in all aspects of the control of air pollution.

Caveat and Operational Considerations

I have been continuously amazed during my almost twenty years of working with analysis centers at their tendency to become information programs instead of analysis programs. Some of the pressures that contribute to this metamorphosis results from the actions of persons in policy positions, usually an echelon or two removed from the center, who make decisions of an organizational or funding nature that are based on a limited understanding of the mission of such a center. Analysis centers are as expensive to operate as other research programs, for professional staff of high standing must produce the products of the center. In our proposed case, for example, an internationally known expert in air pollution should be the Director. He should be supported by a highly competent information manager and staff. There would be a critical cost below which the Director could not obtain the professional manhours needed for the performance of high quality analyses. It often is possible, however, for an analysis center to remain in operation at a reduced budget as an information center minus the analysis function. During any period of economic stress, management decisions often favor retaining funds for laboratory research at the expense of the analysis center. The analysis center then assumes an information orientation, perhaps irreversibly.

Sometimes functional decisions made within the analysis center create an external impression that it is an information operation. This impression leads to an increasing number of information requests rather than analytic requests. The products from the center become such things as bibliographies, reference lists, and collections of abstracts. The products of an analysis center should be state-of-the-art studies, technical responses to technical questions, economic studies, standards, trend reports, surveys, and other analytic activities in the form of letters, memoranda, substantive studies, conferences and seminars.

Another crucial problem is the tendency to fragment an analysis center into two separate operations: one for analysis, and one for information. This separation can become so severe that two budgets, one for each function, are established. Then each new task started in the center tends to become either a research project or an information project. This split in the unifying concept that information analysis is a blend of research and information can be deadly.

Because of these tendencies, it is important, if AGARD decides to implement an analysis center on air pollution, that essential concepts be delineated from the beginning. I would suggest a start-up approach somewhat as follows. An interim management team would be formed that has an excellent stature in NATO countries. This team, after working out its operational procedures, would request from member countries of NATO résumés of those persons having excellent standing in professions capable of or currently dealing with air pollution problems. In cooperation with representatives from member countries the management team would then select one person from the candidates and offer him the Directorship of the proposed center on air pollution. Once appointed, the Director would then be provided the opportunity to visit appropriate member countries to examine the status of existing activities in air pollution, determining both their informational and technical scope. One of the missions of the Director on these visits would be to identify information, communications, and computer staff, and subject specialists, who, while employed at their own laboratories or agencies, could participate in the center on a part time basis only. If it is agreeable to the host country and host organization, these individuals would become their country's representatives for the information analysis center. They would transmit to the center that information which, in their judgment, would be of most value to the center on air pollution, and they might, in turn, also represent the center's interests in the subject in their country. They might also provide, in some cases, substantive studies on an as-called-for basis. These studies would normally be under contract to the center.

The Director would also select the permanent in-line staff of the center for its headquarters operations. The headquarters should be located at an organization where considerable work is being done on air pollution problems so that the permanent staff would have competent persons nearby for consultation and substantive support, when needed. The permanent staff should include a small support staff including an assistant director for the director, an information operations manager, and an operational information staff. The information staff would conduct the collection, storage and retrieval activities of the analysis center. At the request of the Director they would produce announcement bulletins, current awareness services, and other publications as needed to keep users aware of what is going on in air pollution work important to NATO countries. However, their most important function would be to assist those specialist assigned by the Director to do analytic studies. This assistance would consist of delivering to the expert the information he necessarily needs so that his analytical study can be done in a most expeditious and efficient manner.

Finally, I would like to discuss the users of the center's facilities, for they contribute to the operations through their inputs and their questions to the center. When functioning properly, an analysis center should become also a communications center for all those persons engaged in air pollution work, because of its overall viewpoint of research, standards, legislation, monitoring, etc. These persons should be encouraged to provide to the center inputs of what they judge to be the most significant work in the air pollution field. At the same time they should also direct their questions and identify their problems to the analysis center. From his position at the hub of this cross flow of information, questions, and problems, the Director can identify gaps that indicate where work is needed, commission studies to be done, call conferences in critical areas of concern, and order the circulation of information important to the solution of air pollution problems. I am convinced that an analysis center on air pollution would be a major step in helping NATO countries deal realistically with the problems. However, past experience indicates that it would take about five years from the beginning of operations for the center to be contributing fully in all the phases described in this paper.

MARITIME POLLUTION

by

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MARITIME POLLUTION

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When I first accepted the invitation to talk on the subject of Maritime Pollution I had not appreciated the context in which the matter was to be discussed. As Superintendent of the Admiralty Oil Laboratory, which is a Royal Navy Research and Development Establishment, I have been involved in providing laboratory support and technical advice when petroleum products have been the polluting agency and I shall only consider petroleum products, which are likely to produce the majority of pollution incidents, in my paper. However, much of what is said may be equally applicable to other forms of pollution.

My staff have been involved for many years in advising on and testing products used for bilge and tank cleaning, and clearing up minor dockyard spillages, and specifications for such cleaning agents existed and stocks were held in Royal Navy storage when the Torrey Canyon disaster took place. As soon as this disaster occurred help and advice was forthcoming from a multitude of sources as clearly shown in the various official reports produced soon after the incident; in particular the report of the Select Committee of the House of Commons (1), and the Committee of Scientists under Sir Solly Zuckerman(2). Quoting from Sir Solly Zuckerman's paper to the International Conference on Oil Pollution of the Sea in Rome October 1968(3): "It would be equally wrong to suppose that the Authorities in the United Kingdom were lacking in advice." Advice was available to such an extent that it was impossible in the end to deal with all the bits of information coming in from every corner of the Globe: people telephoned from distant parts, from Tokyo and different parts of the United States: many people wishing to sell the British Government detergents or 'what-have-you' to deal with the oil. In this welter of advice and investigation the practical role played by the Royal Navy was to some extent obscured.

The stocks of dispersant* already available in Navy Depots were issued to help in the cleaning up operation and the Navy Contracts Department handled the purchase of the large amount of new dispersant materials needed to deal with the situation. One of the tasks of the Admiralty Oil Laboratory was to carry out laboratory assessment of the products offered to the Navy Contracts Department so that the most effective products were selected. The report(4) produced by Messrs. C.E.Carpenter, L.F.Butcher and A.S.Huxley on "The Laboratory Examination of materials submitted for Treating the Torrey Canyon Oil Spill" shows the mass of information accumulated at this time but mention should also be made of the speed with which laboratory tests were carried out so that the information was available when it was needed. A disaster such as the Torrey Canyon instils a sense of urgency into everyone and the staff at the Admiralty Oil Laboratory worked willingly over weekends and Public Holidays during this period.

Mr.W.E.L.Taylor, another member of my staff, spent a considerable period of time during the cleaning up operations on the beaches of Cornwall and was attached to the Operational Headquarters set up in that area. His report "Torrey Canyon Exercise Mop Up"(5) covers practical experience obtained from actual contact with the problem.

The need for a better understanding of what takes place when oil products are spilt at sea was very soon recognised and some aspects of this problem received the attention of Oil Companies and others who presented their findings at an Institute of Petroleum Symposium(6) soon after the event. The Institute of Petroleum also have set up a committee with a number of Working Parties to study the various aspects and means of dealing with oil pollution. A progress report on this work is to be made at a Symposium on 16th October 1970. Reading these reports now shows how scant was our knowledge at the time and this may explain why many scientists who had no knowledge of petroleum matters felt they knew as much as those who have been in touch with petroleum problems for years. Only now are we beginning to have a clear idea of the conditions under which the water in oil emulsion "chocolate mousse" forms at sea, and which one of the various cleaning up techniques is likely to be most effective at a given stage in the history of an oil spill.

Various efforts have been made to arrange a controlled oil spill and to record the manner in which the oil spreads and the changes that take place in the composition of the oil layer and of the surrounding water. The Royal Navy organised such a spill in May 1970 and the report(7) on planning and operation of this exercise would give some idea of the type of information that people of many scientific disciplines were hoping to obtain to assist them predict the ultimate fate of oil spilt at sea and of the effect such oil spills had on the environment. Mr.Carpenter from AOL was a member of the group of scientists who organised this oil spill.

Having given some information of my Establishment's background to the subject of Maritime Pollution, let us examine what information is needed when oil pollution occurs and the extent to which international co-operation is available and desirable.

In the first place as you are no doubt all aware this is not the first International Group to discuss the subject of Maritime Pollution and many proposals have been made and resolutions tabled regarding the desirability of having information on the subject internationally available.

The Work Programme adopted by the Intergovernmental Maritime Consultative Organisation (IMCO)in May 1967 is given in full as Appendix I and it shows all the areas where action, advice and agreement is desired. Item 11 covers the need to study as a matter or urgency procedures whereby States, regionally or

*NOTE. Dispersant is now being used by most manufacturers in the U.K. to cover materials used to disperse floating oil, rather than the term detergent (in vogue at Torrey Canyon time) which is used for materials for washing up and laundry in the home.

inter-regionally where applicable, can co-operate at short notice to provide manpower, supplies, equipment and scientific advice to deal with discharge of oil or other noxious hazardous substances, including consideration of the possibility of patrols to ascertain the extent of the discharge and the manner of treating it both on sea and land. The desirability of the ships concerned, if involved in an accident, following pre-arranged procedures designed to ensure that the relevant national, regional or inter-regional authorities are alerted as rapidly as possible.

This item is full of subjects I would think suitable for the "Information Analyses Centre" approach. Also much that is needed to deal with an oil spill is available within the military resources of the N.A.T.O. countries, men, ships, scientific advice, support laboratories and ability to operate together in the field. What is almost certainly lacking is any one group or organisation that knows all the resources that are available.

Regional co-operation between governments in cases of oil pollution in the North Sea was recognised by the adoption in June 1968 by Belgium, Denmark, Federal Republic of Germany, France, Netherlands, Norway, Sweden and the United Kingdom of a draft agreement. The agreement intended to be complementary to the work of IMCO calls for the countries to keep each other informed about their national organisations for dealing with oil pollution: about the competent authorities responsible for receiving reports and giving assistance on this matter, about new ways in which oil pollution may be avoided or can effectively be dealt with. This agreement shows that the need has been recognised at Government level for an interchange of information, therefore there should be an excellent possibility of setting up a Maritime Pollution Analysis Centre, if as I think likely this meeting supports such a venture.

Let us look now in more detail at the procedure and requirements for dealing with an oil spill, this will indicate the sort of information that should be provided by each country to the Centre.

Once a major pollution problem has occurred, speed is essential; a grounded ship can sometimes be refloated within a day or so of grounding but could start breaking up soon after; oil escaping into water can in certain circumstances be retained by and salvaged from booms placed around the source but once the oil has spread to a thin film over several square miles of water, treatment is more difficult and expensive in time and material. Therefore the information requirements will be immediate and on the following lines :-

a) The identity of the Authority, probably a Minister or deputy who has the power to authorise action by both civilian and Service personnel to deal with the incident. In the U.K. for incidents within 1 mile of the shore the overall authority is the Ministry of Housing and Local Government. For incidents outside the 1 mile limit the Board of Trade is the responsible authority and operations are controlled from the Naval Maritime Headquarters at Plymouth or Rosyth.

b) Data on the availability of ships - tugs and salvage vessels; tankers and tank lighters; ships suitable for laying booms, spraying dispersant, and discharging sinking agents; possibly dredgers and fire boats.

c) Information on location and effectiveness of booms. Ideally spilt oil should be salvaged and one way to do this in calm waters such as harbours and estuaries is to contain the oil in booms. There are basically 2 types of boom, those that simply contain the oil and secondly booms that absorb it, both types however are of little use with wave heights over about 12 inches and/or water movement of over 4 feet/sec. Booms to contain oil have been available for many years but since Torrey Canyon there has been considerable developments from do-it-yourself types for fishermen consisting of bundling up material like straw in nets to sophisticated catamarans that can lay several miles of boom in an hour or so.[9]

Methods of siting booms in relation to water flow have been subjects for research and suitable siting can considerably improve their efficiency.[10] Another basically type of boom device that should be included here is the bubble barrier.

d) Data on suction devices. Once oil is contained in a boom it must be transferred to a tank of sorts - floating suctions or other devices are needed for this task. Also in this section might be included floating hoses, pumps, and skimming devices which could include the specially designed equipped vessels for this type of oil recovery.

e) Data on dispersants. When the water movement is too great for the use of booms, still the most likely procedure to get rid of the oil will be to spray it with dispersants and agitate so that the oil spreads as very small droplets into the water, in which state natural factors such as sun, oxygen, and bacteria can degrade it as quickly as possible. Materials could be grouped according to toxicity, unfortunately in general the less toxic materials are less efficient and more expensive, therefore are only likely to be used near the shore. However there may be control of toxicity through limitations imposed both by specification and/or legislation.

Also in this section might be included spraying equipment for dispersants, and equipment for dispersing the oil into the water. Recently the Ministry of Technology have patented a cheap device developed by the Warren Springs Laboratory at Stevenage.

f) Data on sinking agents. The French authorities made considerable use of sinking agents in treating the oil from the Torrey Canyon which reached the French coast. Materials used are generally cheap and non-toxic, however special equipment is needed for even moderately efficient application, also it is not a suitable method where there are shellfish beds, where trawling takes place, or near a beach. One of the draw-backs in this procedure is that many of the materials do later release a proportion of the sunk oil.

Equipment for scattering the sinking agents might also be included in the same section which will range from simple powder fire guns to ships like the Dutch dredger GEOPOTES VII fitted with treatment apparatus for dredged-up sand and then pumps and spraying units to scatter the treated sand on to the floating oil.[13]

g) Data on miscellaneous materials. Under this heading absorbing materials will be the biggest group and range from straw[14] and sawdust to foamed plastic. Several devices have been made using a continuous moving loop of plastic foam dipping into the floating oil, returning to a mangle device which squeezes the oil out into a container and then returning to the floating oil to absorb some more.

Other materials that have been submitted are co-agulants so that the oil can be removed as lumps, materials to increase the rate of bio-degradation of the oil and materials to promote combustion of the oil.

h) Data on weather, conditions and water movements. When a pollution incident has occurred the authorities will need to know where the oil is likely to spread or come ashore, so information on tides, currents, prevailing winds etc. will be needed and could be pre-recorded for use in an emergency. However, as in most areas of Europe the weather on any specific day can only be predicted a day or so in advance, sources of up-to-date weather information are necessary. The Commander in Chief, Allied Command Channel, at Northwood, Middlesex, can provide a prediction service on the drift of an oil slick.

i) Ecological and Industrial Information. The best means of treatment or perhaps in some cases non-treatment of any incident will depend on when and where it occurs. It has been suggested that the ideal team for dealing with a pollution incident should include a pollution control officer, an ecologist, and fisheries officer. One needs to know the locations of fishing areas, including shell fish beds, bird sanctuaries, breeding and migration areas, and also areas used for recreation, special industries and power station intakes.

j) Identification of Pollutants. It has very rightly been said that if one could identify with certainty the source of each incident of marine pollution, in most cases a ship, the majority of oil pollution incidents would cease. I therefore think it would be well worth having readily available a list of laboratories equipped and experienced in carrying out fuel and crude oil analyses. In the U.K. at the present moment the Laboratory of the Government Chemist usually deals with samples that may lead to legal proceedings being taken.

k) Legal aspects. A considerable number of new rules and regulations come into force each year, and an increasing proportion of these relate to pollution. Some may be local and relate to one port area. Others may be based on an international agreement and have to be ratified by a certain minimum number of governments before becoming international law. A modern super tanker costs several million pounds, so a country would need to be very sure of its rights before reaching a decision to destroy a stranded ship causing pollution, as was done to the Torrey Canyon, otherwise on top of the cost of clearing up the pollution would be added the cost of the ship.

l) Medical/toxic aspects. This is a very wide field and perhaps because of the difficulties of assessing the effects of small concentrations of pollutants, often lead to disagreement between members of the medical, as well as between members of the scientific profession. Oil itself is not considered a particularly toxic material, but speaking at Aviemore[15] earlier this year, Dr.C.Tarzwell of the U.S. National Marine Water Quality Laboratory said that recent work in his laboratory indicated a build up of potentially dangerous degradation products of oil in fish.

Other pollutants such as mercury, paralytic shell fish poisoning, and chlorinated hydrocarbons[16] have been known and recognised for some time.

Enough has been said to give an indication of the wife ranging types of materials and equipment available just for treating oil pollution and some of the factors to be considered in choosing the best means of dealing with any incident. When this information is expanded to take into account all forms of marine pollution, things that readily come to mind are sewage, the dumping of domestic and industrial waste including radio active materials and warlike stores, and the effluent of a wide variety of chemical processes, it can be seen there must be a vast amount of information that could usefully be assembled in a Marine Pollution Information Analysis Centre so that any incident could be dealt with speedily.

A few final thoughts - first and perhaps most important, from what sources will information be accepted? From experience at the Admiralty Oil Laboratory at the time of Torrey Canyon, manufacturers of chemical agents and recovery devices can produce masses of literature, reports, unsolicited testimonials etc. which frequently are not substantiated when practical tests are carried out. For this reason I feel information should only be accepted from appropriate government sources. Secondly and perhaps equally important would be arrangements for the frequent updating of information.

Some statisticians have predicted that a Torrey Canyon type incident is likely to occur every 10 years. If this is so we are a third of our way towards the next major incident - let us therefore do all we can to promote the formation of a Maritime Pollution Analysis Centre that could provide the right information to enable the people concerned to deal with any type and any size of pollution incident both efficiently and with the minimum damage to the environment.

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APPENDIX I

Work Programme Adopted by the IMCO Council 8 May 1967

In the light of the "Torrey Canyon" disaster, and with a view to avoiding the hazards presented by the carriage of oil or other noxious or hazardous cargoes, it was agreed that IMCO should take the actions indicated below.

Priority is to be given to those items which will develop means of preventing or alleviating the type of problem presented by the "Torrey Canyon" disaster, but the final results of these studies will also indicate any matters which have general application to maritime safety.

In assigning these matters for study, the Council makes clear that although many areas are to be studied no decisions have been made that specific action is or will be indicated in these areas.

Where appropriate, these studies should be undertaken in consultation with other interested international agencies.

To study as a matter or urgency and to report on the following :

1. The contribution which can be made towards maritime safety generally and the prevention of various hazards involved in the carrying of oil or other noxious or hazardous cargoes by the establishment for all necessary classes of ships or sea lanes whether to be introduced by national governments, recommended by INCO, or, at a later stage, made mandatory by international agreement including, in the last case, the enforcement thereof. Consideration should also be given to the value of prohibiting completely the passage of large ships carrying such cargoes in certain areas or on certain routes and further to the contribution which might be made to the problem by guidance of ships from shore-based stations. Possible amendments required to the International Regulations for Preventing Collisions at Sea may be taken into account. Consideration should also be given to the legal and financial aspects of all these problems.

2. Whether ships carrying oil or other noxious or hazardous cargoes should be required to have specified navigational aids in addition to those required by the International Convention for the Safety of Life at Sea, 1960, and should be required to use them within a specified distance of land and in high traffic density areas.

3. Whether movement of ships within a specified distance of land should be guided by shore radio installations and whether and how such vessels should be required to announce their expected time of arrival in such an area where they will be so guided or at the port of destination.

4. Whether ships, and more particularly large ships, when within a specified distance from land, and in areas of high traffic density, should be subject to any restriction of speed, having regard to the manoeuvring capabilities of the ship.

5. The desirability of periodic testing of shipborne navigational equipment so as to ensure its proper and efficient functioning.

6. The appropriateness of international formulation of standards for training and qualifications both of officers and crew on large ships and on ships carrying oil or other hazardous or noxious cargoes and in particular the training and qualifications required to use shipborne navigational equipment, consideration being given in the course of this work to the question of standardisation of licences required for masters, mates, chief engineers, and other ships' officers.

7. The conditions which should govern the use of the automatic pilot and the effect of its use on the behaviour of officers and crew.

8. Whether Chapter II of the International Convention for the Safety of Life at Sea, 1960, should be amended, or other dispositions made, so as to control the design, construction and equipment of ships carrying oil or other noxious or hazardous cargoes (or such ships above a certain size limit), with a view to limiting the risk of collision or stranding and with a view to avoiding or limiting the escape of oil or other dangerous or noxious products in the event of such stranding or collision. This study should include consideration of constructional measures for reducing speed.

9. The routes or sea lanes used by, or established for, large ships carrying oil or other noxious or hazardous products, with a view to any hazards being charted and marked.

Measures to ensure that the ships concerned carry adequate charts, sailing directions, Notices to Mariners, etc.

10. The need to reinforce the look-out systems, particularly at night or in areas of high traffic density, with a view to the formulation of international standards or recommendations.

11. Procedures whereby States, regionally or inter-regionally where applicable, can co-operate at short notice to provide manpower, supplies, equipment and scientific advice to deal with discharge of oil or other noxious or hazardous substances, including consideration of the possibility of patrols to ascertain the extent of the discharge and the manner of treating it both on sea and land. The desirability of the ships concerned, if involved in an accident, following pre-arranged procedures designed to ensure that the relevant national, regional or inter-regional authorities are alerted as rapidly as possible.

12. Continuation and intensification, in accordance with Resolutions 12, 13 and 14 of the International Conference on Prevention of Pollution of the Sea by Oil, 1962, research and exchange of information particularly into the following aspects of pollution:

(a) Prevention of such pollution by mechanical or scientific devices or by development of new procedures.

(b) Methods of destroying the polluting agent without damage to flora and fauna.

The research should cover polluting agents other than oil if liable to be discharged from ships.

13. Whether the International Convention for the Prevention of Pollution of the Sea by Oil, 1954, as amended, requires amendment as regards detection of deliberate pollution and the enforcement of penalties therefore.

14. To what extent it would be possible to meet the wishes of a State which has been affected by a casualty to a ship not under its flag to take part in any official enquiry into that casualty.

15. The extent to which a State directly threatened or affected by a casualty which takes place outside its territorial sea can, or should be enabled to, take measures to protect its coastline, harbours, territorial sea or amenities, even when such measures may affect the interests of ship-owners, salvage companies and insurers and even of a flag government.

16. All questions relating to the nature (whether absolute or not), extent and amount of liability of the owner or operator of a ship or the owner of the cargo (jointly or severally) for damage caused to third parties by accidents suffered by the ship involving the discharge of persistent oils or other noxious or hazardous substances and in particular whether it would not be advisable:

(a) to make some form of insurance of the liability compulsory,

(b) to make arrangements to enable governments and injured parties to be compensated for the damage due to the casualty and the costs incurred in combating pollution in the sea and cleaning polluted property.

17. Definition of the conditions governing the access and employment of seaborne salvage equipment of other flags within the territorial waters of States.

18. The powers of surveillance and control which should be entrusted to coastal States in order to ensure the efficacy of the measures adopted by the Organisation with a view to strengthening the safety of navigation and obviating the danger of pollution.

SUMMING-UP OF THE SPECIALIST MEETING

Harry L. R. Hinkley

Head of Naval Scientific and Technical Information Centre
United Kingdom

Mr. Chairman, Ladies and Gentlemen, I must first of all admit that, in all probability, I have the advantage of many present here to-day in that I have had the opportunity of sighting the various papers before their actual presentation. I can assure you that rather than omit any salient points in the coverage of their topics the authors, as might be expected, have been extremely thorough indeed. I am sure that you will all agree with me that the Speakers are to be congratulated, not only upon the content of their individual papers, but also in the manner of their presentation. I think it is true to say that this is the first occasion, in Europe at least, that this subject has been given such a wide airing.

We have had an unique opportunity to-day to experience what is in effect an example of the tasks of an Information Analysis Centre, inasmuch as the theme has been confined to one particular subject, papers have been presented by specialists in that subject and their content has provided us with the "state-of-the-art".

Messrs Simpson and Murdock have set the facts very thoroughly before us by presenting the problem posed by the continuing world wide proliferation of scientific and technical information, together with proven ideas for its solution. Once again, as in the case of their satellite and moon probes, the United States have got off the ground.

Until such time as a machine is produced to accept the printed word at one end, sort and throw out worthless or duplicate matter at the other, whilst retaining that which is original and worthwhile, the information scientist will have to use every weapon in his armoury to extract reliable and relevant information for the customer.

The Information Analysis Centre is obviously one means of overcoming the problem posed by the world output of information but, our attention has been drawn to the high calibre of staff required and to the financial outlay which one can imagine could well be prohibitive in some countries. Is there not here a possible opportunity for further international collaboration? Most of us in Europe at least are operating the various information services detailed in the first paper, albeit, in a small way and our exchange arrangements are gradually improving. It requires little imagination to visualize an extension of existing collaboration, resulting, in years to come, in the setting up of international information analysis centres to cover those fields of mutual interest and meeting most, if not all, the requirements recommended by Messrs Simpson and Murdock. From little apples big apples grow, and this last 20 years has already seen considerable improvement in international collaboration, particularly within the NATO alliance.

Incidentally, if information analysis centres were staffed as depicted in Figure 19 of this paper there would perhaps be no lack of entrants into the field of information science.

Madam Roeper's paper on a Documentation Centre working in a specialized field once again confirms the organization, methods and procedures which have become internationally accepted, and further supports the need to mechanize and computerize information even in medium sized organizations, despite any great savings in financial outlay. I am sure we all agree that such centres are bound to lean very heavily upon the larger concerns but these latter can also derive considerable benefit from the somewhat smaller but well organized and compatible centres concentrating on well defined areas.

As a user of the Heat Transfer and Fluid Flow Information Analysis Centre operating out of Harwell I can confirm the worth of their somewhat costly subscription information service.

There is a tendency however, on the part of some information centres to supplement their "state-of-the-art" services with a current awareness service which merely draws attention to the existence of copious new information in a particular field. This on its own can be a source of frustration to the user who is then left to his own devices to sort the wheat from the chaff and finally to sight the original work in which he is really interested. One must always consider the feedback to any new service and this I feel, is where the use of second generation microfiche could be economically employed in support of an IAC's current awareness service.

A further thought which arises from this and the previous paper is the essential requirement which cannot be over stressed, for comprehensive profiles of user interests to ensure both effective direction of information and a reduction in time and effort by both the information staff and the user.

The first three papers presented covered the acknowledged need for IACs and descriptions of some of the important areas in which this development has already been carried successfully to fruition. The final papers on Air and Marine Pollution have both highlighted in a forceful way the universal need for information analysis centres in these particular fields, the institution of which could not only be of benefit to the NATO Alliance but also to the rest of the world. Bearing in mind 1970 is Conservation Year, the choice of these two topics is particularly appropriate at this time, though whether the setting up of IACs in these areas should be a NATO or even an United Nation or IMCO responsibility is a debatable point.

So often at meetings of individuals working in the information field the user element is not always directly involved but to-day we have been fortunate in having a paper presented by Mr. Carpenter which if the Author, Mr. Langston, will forgive the expression, comes straight from the horses mouth. Here we are presented with the facts and a plea for assistance from a scientist, an acknowledged world authority in his field.

In the case of marine pollution the European maritime nations are, as we have heard already in close contact and with the advent of the one million ton tanker which is now at the design stage, there will be an even greater urgency in the need for the exchange of vital information should there unfortunately be a repetition on the scale of the Torrey Canyon disaster. Each of us here to-day can suggest other areas in which there is a vital need for the setting up of information analysis centres but the decisions whether or not to do so must lie with our administrators, from both national and international consideration of the user requirements.

I should like to thank you Mr. Chairman for the opportunity of adding my two-pennyworth to to-days deliberations and to say that if the merit of this meeting is to be judged by the highly stimulating discussions which have resulted from the presentation of the papers then you and the Panel are also to be congratulated upon its success.

I am certain that all gathered here will wish me to express their gratitude for the opportunity of attending a most informative Conference.

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