ANNUAL REPORT
FOR PERIOD ENDING JANUARY 31, 1972

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WESTERN RESEARCH APPLICATION CENTER
GRADUATE SCHOOL OF BUSINESS ADMINISTRATION / UNIVERSITY OF SOUTHERN CALIFORNIA
LOS ANGELES, CALIFORNIA 90007
(213) 746-6133
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wesrac
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I. INTRODUCTION
This report presents the results of operations for the fiscal contract year 1 February 1971 to 31 January 1972, of the Western Research Application Center (WESRAC), a Regional Dissemination Center for the NASA technology collection and other approved sources. The report has been prepared in accordance with the requirements of Article XV, Paragraph A5, National Aeronautics and Space Administration Contract No. NASW-1869.

Following the completion of a feasibility study, WESRAC was organized at the University of Southern California, Los Angeles, as a division of the Graduate School of Business Administration and under the financial and administrative control of the USC Research Institute for Business and Economics (USCRIBE).

Three quarterly reports have been published during the year. Some of the material from these interim reports has been repeated in order to summarize activities and to give a more complete evaluation of the year's operations and results.

In addition, this report includes WESRAC's goals, problems and future plans for the effective dissemination of technology in the West.

WESRAC will be glad to provide any additional facts or information on the period covered by this report if they are desired.

A. Kendell Oulie
Director
II. ADMINISTRATION
The departmental organization of WESRAC has remained basically unchanged from that of its original conception. It has proved to be workable and efficient as a means of assigning duties and responsibilities for the various functions of the center. Re-arrangements in functions and titles, however, are currently being evaluated for implementation in the near future. The complete current organization chart is shown in Appendix A. Following is the basic departmental arrangement:

![Organization Chart]

The details of particular activities are described in subsequent sections of the report under each departmental heading.

A continuing administrative task is to fill positions with qualified and carefully selected personnel in order to create an efficient and productive operation. However, unavoidable turnovers, especially in part-time student employees, have hampered operating continuity at times. Key positions, therefore, are filled with full-time salaried personnel; students are employed effectively as supporting clerical help and as technical specialists in particular disciplines.

Although the numbers have varied slightly during the year, the WESRAC staff at the end of the fourth quarter consisted of 15 full-time and 12 part-time employees--a reduction from the 18 full-time and 11 part-time employees at the previous year-end. The number of personnel in each department is shown as follows:
WESRAC PERSONNEL ASSIGNMENTS BY DEPARTMENT

<table>
<thead>
<tr>
<th>DEPARTMENT</th>
<th>FULL-TIME</th>
<th>PART-TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Engineering</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Information Systems</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Marketing</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>15</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

ACADEMIC RELATIONS

The establishment of the center at the University has, as originally predicted, resulted in many benefits for both WESRAC and USC. The center benefits from University association, its faculty and student assistance, use of the GSBA computer facility, libraries, and other informational sources. The University, through WESRAC, enjoys a direct contact with business and industry, and has more opportunities to give students financial aid, work experience and instruction. The center also serves as a vehicle through which USC can demonstrate service to the community and the economy.

WESRAC continues to provide lecture, search, and information services to classes, professors and research projects on campus, as well as to other universities and educational/research institutions in the West.

THE WESRAC PRODUCT

To its basic services (customized search services, computer software, documents, seminars) WESRAC has added a new service this year called the Technology Intelligence Program. Descriptions of this and other services are given in section IV of this report.

CLIENT AGREEMENTS

WESRAC continues to offer three basic plans to clients (plans "A,"
"B", and "C") which require the deposit of an annual retainer fee and are designed to anticipate the requirements for services during the year. More service for the same fee can be given to organizations with larger volume computerized or manual technology search requirements. All fees for service are deducted from the client's annual commitment. Services exceeding this commitment are billed additionally at rates corresponding to the plan in use by the client. At any time during the term of plan "B" or "C", a client may "upgrade" by making a deposit of the difference in plan commitment, thereby taking advantage of reduced unit costs.

Although it is WESRAC's aim to retain clients on this annual plan basis, service is also provided to "special" clients on a bill-as-used basis. Individual searches are performed by non-clients when required at 20% over client unit charges.

REVIEW OF SERVICES RENDERED

The following serves as a summary of the numbers and types of organizations served by WESRAC during the calendar year 1971:

1. Number of organizations served: 320 (includes 44 individuals). An organization or individual using WESRAC Services more than once is still counted as one (1).

2. Breakdown of users by type of business:
   a. Industrial....190 d. Medical.......5
   b. Commercials....45 e. University...26
   c. Governmental....8 f. Other.......46

3. Breakdown of commercial/industrial users by large/small business:
   a. Large (over 500 employees): 104
   b. Small (under 500 employees): 131

   TOTAL: 235

For complete statistics on the year's operations and services rendered, see Appendix B.
WESRAC continued to work closely with other RDC centers during the year through the medium of ACORDD, the Association of Regional Dissemination Center Directors. Quarterly meetings made possible the implementation of the network and economy-of-scale philosophies which permit one center to perform all the work on a given job for all the centers. Cooperation between centers also eliminates the need for each to maintain all technology resources because the resource files of each are, in fact, resources of all. TWX, telephone and mail are used to maintain close, rapid working relationships.

Examples of shared files in the past year have been the Department of Defense file, the Engineering Index, the Chemical Abstract Society files and ERIC. An example of cooperative work has been the utilization of one center to reproduce abstract cards for all centers.

Further cooperative efforts have been made in the sharing of marketing and product information.

Working relations with other Regional Dissemination Centers have made it possible to provide personal, technical support to industry in most industrial areas of the United States and to thus encourage broad dissemination and use of NASA technology developments.

GENERAL OVERVIEW OF THE YEAR

The following sections of this report cover the major operations of WESRAC for the contract year. The reader is referred to the three quarterly reports published previously this year for more complete background information. A year-end summary is given in section VII of this report.
III. MARKETING AND PUBLIC RELATIONS
The Marketing Department is responsible for publicizing and "selling" the WESRAC product. This includes giving sales presentations to individuals and groups, initiating contracts, maintaining personal contact with current clients, following up on all inquiries as to WESRAC services, promoting WESRAC through publicity and advertising, and, most importantly, educating the user and potential users on the value of utilizing technology collections.

The current Marketing staff includes two experienced, full-time service representatives, a general manager of public relations, a secretary and an assistant.

WESRAC's service territory includes the states of California, Alaska, Hawaii, Oregon, Washington, Arizona, Idaho, and Nevada. Major marketing efforts in 1971 continued to concentrate on California where nearly two thirds of WESRAC's prospects are located. While the majority of clients are in Southern California, client contracts with companies in Northern California have increased appreciably, and direct mail and phone contacts with organizations in the other states have resulted in increased usage of the center's services. Due to recent publicity campaigns, numerous inquiries from states across the nation and several foreign countries have been generated.

It must be mentioned, again, that the general economic instability seen in 1971, especially in the aerospace-oriented western states, has caused a severe curtailment of WESRAC marketing results. In the fourth quarter, no real trend could be discerned as to whether or not this situation is changing for the better.
As previously described in the second and third quarter reports, WESRAC was the producer of one seminar and a participant in two major conferences this year. The very successful WESRAC Fireproofing and Safety Symposium held in May and produced by WESRAC was also supported by NASA, the SBA and the Los Angeles Chamber of Commerce. WESRAC participated in the Electro-Optics '71 West Convention held at the Anaheim Convention Center, also in May and the NASA-Ames Research Center Conference, "Exploring Aerospace Technology for Solution to Community Problems," held at Moffett Field, California, in October.

Each of these was beneficial as a public service and as publicity for WESRAC and the NASA Technology Utilization Program. They generated new leads and inquiries about WESRAC services and offered new ideas and possibilities for future conferences and seminars of this nature. The WESRAC Fire Symposium generated some noteworthy transfers of technology which are included in Section VI of this report. A survey of audience reaction was made subsequent to the symposium. The questionnaire with responses is included in Appendix D.
The majority of WESRAC's direct mailings are designed not only to publicize the center and its services, but also to elicit response by phone or mail. Some of the major promotional mailings sent during the year included letters and return request cards to NASA Tech Brief respondents. To computer-oriented companies, WESRAC mailed Computer Software brochures describing program abstracts available from WESRAC through COSMIC. The new WESRAC general brochure, supportive materials, and document order forms were sent to those responding to WESRAC's "Random Walk" feature in Design News Magazine. The WESRAC Newsletter (including two issues of the new "Technology Intelligence" newsletter) went to a broad section of prospects in California.* The chart below summarizes the major direct mailings sent in 1971.

<table>
<thead>
<tr>
<th>DATE SENT</th>
<th>MAILING</th>
<th>NO. SENT</th>
<th>RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 1971</td>
<td>Newsletter</td>
<td>10,000</td>
<td>by phone or letter: 17</td>
</tr>
<tr>
<td>Mar 1971</td>
<td>Tech Brief Letter</td>
<td>37</td>
<td>1 letter &amp; 1 Search request</td>
</tr>
<tr>
<td>Apr 1971</td>
<td>Newsletter</td>
<td>9,000</td>
<td>by phone or letter: 9</td>
</tr>
<tr>
<td>Jun 1971</td>
<td>Newsletter</td>
<td>8,707</td>
<td>by phone or letter: 25</td>
</tr>
<tr>
<td>Aug 1971</td>
<td>Tech Brief Letter</td>
<td>130</td>
<td>8 reply request cards</td>
</tr>
<tr>
<td>Aug/Oct 1971</td>
<td>Computer Software</td>
<td>1,800</td>
<td>reply cards: 270; program abstract orders: 55</td>
</tr>
<tr>
<td></td>
<td>No. &amp; So. Calif.</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>Sep 1971 to date</td>
<td>Mailings Random Mail</td>
<td>3,938</td>
<td>document orders: 162</td>
</tr>
<tr>
<td></td>
<td>Walk response pack</td>
<td></td>
<td>minisearch orders: 70</td>
</tr>
<tr>
<td>Dec 1971</td>
<td>Tech. Intelligence</td>
<td>9,070</td>
<td>reply cards: 207</td>
</tr>
<tr>
<td>Jan 1972</td>
<td>Tech. Intelligence</td>
<td>8,880</td>
<td>document orders: 14</td>
</tr>
</tbody>
</table>

*Specific descriptions and statistics for "Random Walk" and "Technology Intelligence" are given on the following pages.
"RANDOM WALK", WESRAC's running feature in the national magazine Design News has been one of the most successful promotional projects to date. Although it has been discussed in quarterly reports, a copy of the introductory article and a sample "Random Walk" column have been included in Appendix C of this annual report to clarify and help in evaluation of the project. The following data indicates the nature and level of "Random Walk" responses obtained thus far from 12 issues of the magazine, (August - January issues).

A. Responses
Number of reader service responses: 8,789
Number of individuals responding: 3,938
Average number of items checked per individual: 2

B. Responses by geographical area
Number of individuals responding in WESRAC's area: 858
Number of individuals responding outside WESRAC's area: 3,080

<table>
<thead>
<tr>
<th>Responses by RDC areas</th>
<th>Responses by foreign country</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARAC 887</td>
<td>Canada 10</td>
</tr>
<tr>
<td>KASC 814</td>
<td>England 2</td>
</tr>
<tr>
<td>NCSTRC 243</td>
<td>France 1</td>
</tr>
<tr>
<td>NERAC 726</td>
<td>Israel 16</td>
</tr>
<tr>
<td>TAC 376</td>
<td>Sweden 1</td>
</tr>
<tr>
<td>WESRAC 858</td>
<td>Turkey 1</td>
</tr>
<tr>
<td>(Puerto Rico 2)</td>
<td>Venezuela 1</td>
</tr>
</tbody>
</table>

C. Results
Number of document orders received: 162
Number of minisearches ordered: 70
Number of prospects and clients resulting from marketing follow-up of Random Walk leads: 5 prospects, 1 client.
As a marketing follow-up "Random Walk" responses, a post card questionnaire was sent to the first 100 individuals ordering additional information (sample in Appendix C). The following is a summary of the results of that survey:

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>The additional information</td>
<td></td>
</tr>
<tr>
<td>1. Was very useful</td>
<td>18</td>
</tr>
<tr>
<td>2. Had some value</td>
<td>31</td>
</tr>
<tr>
<td>3. Did not help me</td>
<td>5</td>
</tr>
<tr>
<td>4. No response</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>56</td>
</tr>
<tr>
<td>WESRAC service looks valuable and I plan to use it some time</td>
<td></td>
</tr>
<tr>
<td>1. Yes</td>
<td>48</td>
</tr>
<tr>
<td>2. No</td>
<td>5</td>
</tr>
<tr>
<td>3. Not certain</td>
<td>2</td>
</tr>
<tr>
<td>4. Possibly</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>56</td>
</tr>
</tbody>
</table>

TECHNOLOGY INTELLIGENCE (TI) is the name of the new WESRAC Newsletter, the first issue of which was published in December. Copies of this issue and the January 1972 issue are included in Appendix C. Fashioned after the "Random Walk" concept of capsule reporting on various new items of interest and designed to include various other news reports and editorials, TI has brought extremely favorable responses from its recipients. The following data indicates the nature of this response as of January 31, 1972.

1. Number of responses to particular items: 478
2. Number of individuals responding: 207
3. Average number of items checked per individual: 2
4. Documents requested (response to first mailing): 14
5. Minisearches requested (response to first mailing): 1
6. Responses from outside State of California: 10
The following is a complete list of articles and advertisements published during the year which concerned WESRAC.

<table>
<thead>
<tr>
<th>NEWSPAPER OR PERIODICAL</th>
<th>DATE</th>
<th>TITLE (if any)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles Times</td>
<td>April 19, 1971</td>
<td>&quot;Firefly Helps in Reducing Time to Detect Bacteria&quot;</td>
</tr>
<tr>
<td>Industrial News</td>
<td>May 10, 1971</td>
<td>&quot;Groups to Share Safety Fire Prevention Data&quot;</td>
</tr>
<tr>
<td>Building News</td>
<td>May 14, 1971</td>
<td>&quot;WESRAC to Present Fire Prevention Seminar May 27&quot;</td>
</tr>
<tr>
<td>Los Angeles Times</td>
<td>May 28, 1971</td>
<td>&quot;Space Spin-off Materials to Aid Fire Prevention&quot;</td>
</tr>
<tr>
<td>Orange County Evening</td>
<td>August 18, 1971</td>
<td>&quot;Smog Data Recorded&quot;</td>
</tr>
<tr>
<td>Industrial News</td>
<td>August 25, 1971</td>
<td>&quot;Key Words Lead to Volumes at WESRAC&quot;</td>
</tr>
<tr>
<td>Los Angeles Herald-Examiner</td>
<td>August 28, 1971</td>
<td>&quot;Aerospace Benefits Cited Here&quot;</td>
</tr>
<tr>
<td>Trojan Family</td>
<td>September, 1971</td>
<td>&quot;WESRAC Computers Help Fight Pollution&quot;</td>
</tr>
<tr>
<td>Beverly Hills Courier</td>
<td>September 10, 1971</td>
<td>&quot;WESRAC Helps Us Fight Smog&quot;</td>
</tr>
<tr>
<td>El Sereno Star</td>
<td>September 30, 1971</td>
<td>&quot;USC Computers Aid Fight Against Pollution&quot;</td>
</tr>
<tr>
<td>Los Angeles Herald-Examiner</td>
<td>November 9, 1971</td>
<td>&quot;Space Spinoffs Hailed&quot;</td>
</tr>
<tr>
<td>Chemical &amp; Engineering News</td>
<td>December 6, 1971</td>
<td>&quot;Study of R&amp;D Costs&quot; (Letter to Editor)</td>
</tr>
<tr>
<td>RADIO ADVERTISING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KNX Newsradio 1070</td>
<td>May 8, 1971</td>
<td>&quot;Science Editor to Discuss Fireflies...&quot;</td>
</tr>
<tr>
<td>PAID ADVERTISEMENTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLA Bulletin</td>
<td>Quarterly</td>
<td>&quot;Technology at Your Fingertips&quot;</td>
</tr>
<tr>
<td>Wall Street Journal</td>
<td>September 14, 1971</td>
<td>&quot;WESRAC's Technology Brokerage Is Open for Business...Yours&quot;</td>
</tr>
<tr>
<td>SLA Membership Directory</td>
<td>1971</td>
<td>&quot;Technology At Your Fingertips&quot;</td>
</tr>
<tr>
<td>Fortune Magazine</td>
<td>January 1971</td>
<td>&quot;NASA/USC Combine to Offer Technology Intelligence...&quot;</td>
</tr>
</tbody>
</table>
One advertisement was printed by WESRAC during the fourth quarter. This full-page ad entitled "NASA/USC Combine To Offer Technology Intelligence in Ten Days - or Less." ran in the California Edition of Fortune Magazine. The ad, which is included in Appendix C, offered a return coupon saying "Please tell me how my Technology Intelligence needs can be answered by WESRAC." Nine responses have been received to date.

WORK WITH THE PUBLIC SECTOR

During the fourth quarter WESRAC met with the Los Angeles Aerospace Technology Application Committee (ATAC). This committee, appointed by the Mayor of Los Angeles, includes senior executives in business and government. It was organized in September 1971 to develop plans to more fully utilize the high technology skills available in Southern California.

To accomplish this, the committee is formulating programs which will attempt to transfer technologies resulting from aerospace research and development to non-aerospace industries and which will help solve increasingly complex urban and social problems.

Initial contact was made with ATAC in November 1971. As a result, WESRAC was invited to participate in a meeting at the office of the Mayor in December. A presentation of this group was made by the Director of WESRAC. Present at the meeting were government officials, representatives of the California Professional Resources Development Center, the Department of Human Resources Development, and three WESRAC representatives.

A follow-up to this meeting was held at City Hall in January 1972 where an expanded group was exposed to WESRAC capabilities. Among those present were the General Manager, Personnel Department, Los Angeles; and the Corporate Director, Manpower Resources, Lockheed Corp.
As a result of this conference, the City of Los Angeles initiated plans to employ technical specialists in city departments. They will be responsible for seeking technologies which can be utilized by the community in the solution of urban problems. These employees will work closely with WESRAC to find the technical information of greatest benefit.

The Executive Secretary to the Committee and a member of the committee who is also a consultant to the Mayor had an extensive briefing at WESRAC in January. They and the general committee agreed that WESRAC is a key ingredient to the successful transfer of technology.

To implement the objectives of ATAC, plans are underway to place 200 available, creative scientists and engineers with companies which are willing to attempt technology transfers. To provide the technical information that will be required to accomplish this, these engineer/scientists will utilize WESRAC to obtain the latest developments in their fields of interest. Toward this end, WESRAC has been invited to make a presentation in February at City Hall to a group of executives concerned with increased utilization of technology.
IV. ENGINEERING AND SCIENTIFIC APPLICATIONS
FUNCTION & STAFF

The Engineering and Scientific Applications Department is responsible for the quality of the WESRAC product. This group must also maintain working contact with the client and assist him in making efficient use of the service he has purchased.

The staff of this department is composed of a manager, assistant manager, secretary, and a number of part-time specialists. Most of these part-time employees are graduate students at USC where WESRAC has been able to obtain engineering and scientific specialists in almost any discipline required to carry out its personalized search services.

METHODS OF SEARCHING AND REPORTING FOR CUSTOMIZED SEARCHES

Customized searches include Current Awareness Searches (CAS), which provide a monthly up-dating of information on a particular subject/s, and Retrospective Searches (Retros), which provide information on a particular subject/s for an indicated period of time.

When a client specifies his general problem or area of interest, the WESRAC specialist then consults with him to define the search area and creates the computer search strategy. A search by computer is made of the appropriate NASA, DOD and/or other available tapes or data sources. (More than 50 data sources are available; a partial listing is included in Appendix E.) The findings are evaluated by the WESRAC specialist and screened to provide only specifically applicable results to the client. Two copies of a report containing abstracts of all pertinent documents are provided to the client. Full documents may be ordered from WESRAC in hard copy or microfiche.

OTHER SERVICES AVAILABLE

Other WESRAC services for which the Engineering and Scientific Applications Department is responsible are Standard Interest Profiles and
Technology Intelligence Programs.

Standard Interest Profiles (SIP) are monthly searches of new material available on more than 200 pre-selected popular subjects from NASA, DOD, and Engineering Index files.

WESRAC's new service concept, the Technology Intelligence Program (TIP) is a total technical information service providing Current Awareness and Retrospective searches of all available data banks necessary to fulfill a client's needs. It is based on a preliminary, comprehensive, systematic, and detailed analysis of the client's areas of interest by WESRAC specialists. This is followed by a close working relationship between the client and his counterpart at WESRAC. TIP is priced annually on a quote basis. WESRAC's new general brochure, which describes this program, is included in Appendix C under "Random Walk".
MONTHLY SEARCH ACTIVITY

The following chart shows the breakdown of the monthly search activity performed by WESRAC's Engineering and Scientific Applications Department for the contract year. The first column represents the number of Retrospective Searches performed, and the following five columns show the number of times various data banks were used to perform those searches (NASA, Department of Defense, Engineering Index, Chemical Abstracts Condensates, and miscellaneous others). The last three columns represent the number of Total Subjects Searched, the Number of Current Awareness Searches, and the number of Promotional (special) Current Awareness searches respectively.

<table>
<thead>
<tr>
<th>Month</th>
<th>TOTAL (RETRANS)</th>
<th>NASA</th>
<th>DOD</th>
<th>EI</th>
<th>CA</th>
<th>OTHER</th>
<th>TOTAL SUBJECTS SEARCHED</th>
<th>REG CAS</th>
<th>PROM CAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEB</td>
<td>18</td>
<td>12</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>14</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>MAR</td>
<td>26</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>16</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>APR</td>
<td>25</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>15</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>MAY</td>
<td>30</td>
<td>11</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>16</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>JUN</td>
<td>25</td>
<td>10</td>
<td>0</td>
<td>6</td>
<td>2</td>
<td>7</td>
<td>19</td>
<td>26</td>
<td>14</td>
</tr>
<tr>
<td>JUL</td>
<td>15</td>
<td>6</td>
<td>1</td>
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V. INFORMATION SYSTEMS
FUNCTION & STAFF

The primary functions of the WESRAC Information Systems Department are to provide information and reproduction services to the Engineering and Scientific Applications Department, the Marketing group, and the clients. Computer tapes, abstract card files, journals, microfiche, and printed documents and publications are maintained by Information Systems. This group is also responsible for computer searches, preparation of final reports, and the filling of document requests.

To carry out these responsibilities, the department is staffed with a manager, documents supervisor, accountant, computer programmer, computer operator, two assistants, and a number of part-time clerks.

NEW DEVELOPMENTS

As announced in the second quarter report, WESRAC received the GRA (Government Reports Abstracts) tapes this year. These are more informative, efficient, and economical than the previous method of purchasing individual abstracts. Part of WESRAC's 360 NASA Linear search program is compatible with GRA and DOD (Department of Defense) tapes. The file maintenance jobs for GRA and the NASA STIMS tapes were completed during the third quarter. This computer-indexed tape increases the resources available to WESRAC.

DATACON SYSTEM

Information Systems developed the WESRAC DATACON System for the use of the Center's scientists, engineers, and all other interested personnel. DATACON is a direct access system, on-line, which provides instant knowledge for its users.

The DATACON files consist of two disc files. One contains bibliographic data and the other contains strings of accession numbers listed by indexing terms.
The system delivers bibliographic information containing report accession numbers, titles, and all terms used to index the individual reports. This information is reproduced on either a Console Typewriter or a 1403 Printer.

DOCUMENT STATISTICS

The following are the document statistics for the fourth quarter. Complete statistics for the year are given in Appendix B.

Number of Abstract and Citations delivered to Clients: 6,795

Number of Documents and Microfiche delivered to Clients: 369

Total: 7,164
VI. SOME OUTSTANDING EXAMPLES OF TECHNOLOGY TRANSFERS
It is felt that one of the important yardsticks of success of a Regional Dissemination Center's activity is the degree to which the technology contained in the RDC's data banks is put to commercial use. While the long-term effects of technology transfers are not always immediately discernible, the following are examples which came to light in 1971. These show the potential benefits that could be derived by others as a result of the services rendered by WESRAC.

1. SPECTROMAGNETICS INDUSTRIES - Hayward, California
   
   **Business:** Small business engaged in the development and manufacture of high energy physics devices.
   
   **Assistance Provided:** WESRAC conducted a literature search on the subject of "Ion Sources" to assist the company's personnel engaged in an internal research program to develop an efficient and reliable industrial ion source. The company felt that a key to their research program would be the knowledge and use of all possible existing technology.
   
   **Results:** The president of Spectromagnetic Industries has stated in a letter, "We have on our staff several highly qualified technical people who have spent many years in this field; from the WESRAC search, we obtained eighty (80) excellent references, at least forty (40) of which were new to us and extremely useful. It is estimated that at least a month of effort by a senior member of our staff would have been necessary to search a local library file for the necessary information; also, it is unlikely that we would ever have been able to locate many of the abstracts isolated by the WESRAC search. The literature search alone saved us approximately $3,000 on this single project."
   
   The research staff of this company estimates that at least three months basic research effort was saved, and their technical competence, as exhibited by the final report, enabled them to mount a major funded program with a semiconductor manufacturer which can result in a doubling of their present business volume.
2. KUSTER COMPANY - Long Beach, California

Business: Manufacturers of subsurface instruments.

Assistance Provided: In late December of 1970, Mr. Barlow, Chief Engineer of Kuster Company, called upon WESRAC to conduct a technology search. This company has been in the subsurface instrumentation field for many years, and now they were looking for a better, highly efficient thermal insulation material that would offer better protection to their well surveying instruments. It was felt that NASA had very probably developed the desired thermal insulating material in connection with meeting similar exacting space exploration protective requirements.

Results: According to Mr. Barlow, the search results were outstanding. His company has now developed a new insulation for their subsurface surveying instruments as a direct result of WESRAC's search. The results and details of the development are highly proprietary because of the intense competition in Kuster's field of business.

The insulating material they now use was virtually a direct transfer of technology developed for space, requiring relatively minor modification to satisfy Kuster's needs.

Although it is most difficult to accurately estimate just how much money was saved, there were certainly several months of searching and development time saved as a direct result of the WESRAC search. This would represent many thousands of dollars in man-hours in addition to the very important time factor. Mr. Barlow has stated, "We could not have done it without WESRAC's assistance."

3. McCULLOCH ELECTRONICS CORPORATION - Los Angeles, California

Business: Battery manufacturing.

Assistance Provided: WESRAC performed an extensive and thorough literature search on "Nickel-Cadmium Batteries."
Results: This company has generously acknowledged the contribution of NASA research in the creation of a new, fast charging battery system for both cadmium and lead acid cell batteries. The objective of their research originally was to develop a push button electric starter for saws and outboard engines. This was accomplished with such overwhelming success that a new corporation was set up to introduce this electric power system for application to the medical equipment industry, toys, household appliances, and battery-powered tools. McCulloch officials, in commenting that, in addition to the inestimable dollar value of new marketing applications, at least six months of research activity was by-passed as a result of the wealth of information supplied them through WESRAC.

4. ALR RESEARCH ASSOCIATES - Los Angeles, California

Business: Consultants and medical instrumentation development.

Assistance Provided: Dr. Semenov attended the June 11-12, 1970 Fluidics Workshop sponsored by WESRAC, NASA, and the SBA at the University of Southern California. The purpose of the workshop was to acquaint the business community with the state of the art in fluid logic control devices.

Results: Dr. Semenov is a specialist in the area of ear, nose, and throat. ALR has been performing research in the development of the rhinometer. The purpose of this rhinometer is to measure air flow and air pressure differentials in the nose. Dr. Semenov states that the information received at this workshop had a dollar value in excess of $100,000 toward the development and use of the rhinometer. In addition, the course provided information that will be of assistance in training medical doctors in the use of the rhinometer. Dr. Semenov also stated that the method of presentation at this workshop was of assistance to him with his general teaching techniques.

Dr. Semenov is also a Deputy Coroner in Los Angeles County. A continually recurring problem is the unexplained death of
apparently healthy babies. One use of the rhinometer being developed is in the research towards these unexplained deaths. Current research has indicated that babies under the age of six months cannot breathe through their mouths, but must breathe through their noses. The "unexplained" deaths are believed to be caused by mucus in the nasal passage which causes suffocation. The rhinometer is being used to measure the amount of air flow necessary to remove the mucus blockage in autopsies. This information properly used may be a major input toward decreasing the incidence of these unexplained deaths.

Dr. Semenov is an outstanding and very strong booster of NASA and its TU program. He states, "The principle thing NASA has brought back from the moon is Medical Know-how, not rocks."

5. A. G. BARSTOW COMPANY - South Gate, California

**Business:** A small business of 12 employees which distributes, designs, and installs hydraulic equipment. They specialize in counter and filler systems complete with controls.

**Assistance Provided:** The A. G. Barstow Company was represented at the same Fluidics Workshop mentioned previously.

**Results:** As a result of information obtained from this workshop, this company has been able to get into new areas of business not previously within their competitive capability. The new areas include equipment for counting and filling explosive products such as various solvents and adhesives. They state that they have sold four systems since the workshop and that they anticipate additional sales of at least $20,000 during FY 1972 in these new areas.

6. CONQUIP, INC. - Upland, California

**Business:** Small business of 17 employees which designs, manufactures, and distributes hydraulic machinery and systems.
Assistance Provided: Another company represented at the Fluidics Workshop, Conquip has been in the hydraulic business for ten years, but had no previous understanding of fluid logic control devices. The workshop gave them an awareness of the state of the art.

Results: As a direct consequence of the information obtained at the workshop, Conquip, Inc. became a distributor for Pitney-Bowes fluid logic control equipment. They are utilizing the knowledge gained at the workshop in improved designs of hydraulic systems.

The company's gross business has increased $100,000, annually, which is a 13% growth. This was accomplished in the face of declines as high as 45% by competitive companies. Each month Conquip conducts a seminar on fluid logic control attended by 12 to 16 representatives from their customers. They anticipate that these seminars will add another $100,000 to their business volume in 1972.

As a direct result of the WESRAC-sponsored Fluidics Workshop, a small company was able to expand their business at a considerable profit.
VII. SUMMARY AND CONCLUSIONS
SUMMARY AND CONCLUSIONS

1971 has been a difficult year in the area of the country served by WESRAC --- California and the West. Unemployment due to reduction in Government contracts approached disaster levels in Southern California and Washington. This was felt in both large companies which were prime government contractors and in small companies which relied on sub-contracts. Money for research and development and for trying new ideas appeared to be extremely tight.

WESRAC service to industry remained about the same as in the previous year despite great efforts to expand. A number of efforts of a special nature were utilized during the year to bring WESRAC services to the attention of individuals who should be users of this vital resource. These have been described in the various sections of this report. While results have not been as great in some instances as desired, the continuous impact of favorable publicity and personal calls must have a cumulative effect on future results.

The new year will see some new ideas and more emphasis on the education of potential users of WESRAC service. There is no doubt at WESRAC that the use by industry of large technology collections, to avoid duplication of work already done by someone else and to keep up with the massive number of technology developments of recent years, is essential to advancement in the economy. Only time and the methods used will determine how long it will take to incorporate this program into business and industry in general.
VIII. APPENDICES
APPENDIX A

WESRAC ORGANIZATION CHART
APPENDIX B

STATISTICS AS REQUESTED BY NASA-TUD

1. Issued Abstracts Relative to Microfiche or Hard Copy Documents
2. Hard Copy Issued by STAR and IAA Category
3. Microfiche Issued by STAR and IAA Category
4. Marketing/Service Contacts (Clients)
5. Marketing Approaches (Non-Clients)
6. Large vs Small Annual Clients
7. Large vs Small Special Clients
8. Annual Contract Clients by SIC Code
9. Special Clients by SIC Code
### APPENDIX B1

**ABSTRACTS AND CITATIONS DELIVERED TO CLIENTS COMPARED TO DOCUMENTS & MICROFICHE ORDERED**

By contract quarters beginning Feb 1, 1970

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APPENDIX B3

Page 1

MICROFICHE ISSUED

BY STAR AND IAA CATEGORIES

By contract quarters beginning Feb. 1, 1970

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(APPENDIX B3 continued)
Page 2

MICROFICHE ISSUED
BY STAR AND IAA CATEGORIES

By contract quarters beginning Feb. 1, 1970

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### MARKETING/SERVICE CLIENT CONTACTS
By contract quarters beginning Feb. 1, 1970

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## MARKETING APPROACHES TO NON-CLIENTS

By contract quarters beginning Feb. 1, 1970

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*Estimated number of individuals personally exposed to WESRAC
**APPENDIX B6**

**LARGE vs. SMALL ANNUAL CLIENTS**  
*(Cumulative)*

By contract quarters beginning Feb. 1, 1970

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*Small = under 500 employees*
APPENDIX B7

SPECIAL CLIENTS
(Individual Search and Service Buyers)

(Note: the numbers below do not reflect frequency of use.)

By contract quarters beginning Feb. 1, 1971

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*Small = under 500 employees
## ANNUAL CONTRACT CLIENTS BY SIC CODE

(Cumulative for the year)

(By contract quarters beginning Feb. 1, 1970)

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(Cumulative for the year)

(By contract quarters beginning Feb. 1, 1970)

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(Individual Search Buyer)

(By contract quarters beginning Feb. 1, 1971)

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APPENDIX C

ADVERTISING AND PUBLICITY

1. RANDOM WALK
2. WESRAC NEWSLETTER: TECHNOLOGY INTELLIGENCE
3. ADVERTISEMENTS
4. WESRAC MAILINGS
Introductory Editorial
Sample Random Walk Column from Design News
Initial Response Letter
  Brochure
  Abstract
  Order Form
Questionnaire
Facsimile of Reply Card
Announcing RANDOM WALK:

We have a new information service for you!

Who’s “we”? Design News is one partner; the other one is WESRAC, a non-profit technology utilization center. WESRAC operates within the Graduate School of Business Administration, University of Southern California, Los Angeles.

What is RANDOM WALK? In the original meaning, it designates a computer strategy giving you an overview of trends in situations where many variables and broad variability ranges make it impossible to investigate the field in point-by-point detail. And that’s what has been happening in engineering as well: too many new developments to track by actually reading all the original information sources page-by-page. RANDOM WALK is a proprietary computer search program to select useful information for engineers from over 8,000 documents entering monthly into the NASA data bank. Document sources include NASA, DOD, other government agencies, Engineering Index, and (to about 35 percent) foreign sources.

How does it work? In each issue of Design News, you will find a sampling of new information—reports, data, surveys, individual designs, forecasts, what-have-you. Today, look for page 70. Selections are made jointly by WESRAC and Design News editorial staff members. As we go along, we will be guided by feedback from you. If an item interests you, check the number on the reader service card and mail it back to us. WESRAC will send you a simple order form. (They are non-profit, but not independently wealthy, so documents and services don’t quite come for free. However, you might be surprised at the low cost of individual items and even complete computerized information searches.)

Why are we doing this? We almost hesitate to mention “information explosion” for the umpteenth time, but this is what’s happening. And we are willing to experiment with any new ways to help you cope.

Kurt F. Kircher, Editor-in-Chief
Random Walk is a proprietary computer search program to select useful information recently entered in the WESRAC technology utilization center computers. If an item interests you, circle the number of the Reader Service Card and you will receive additional information plus an order form for the complete document. The Editorial on page 3 explains the process in detail.

FLYING BICYCLES for competition and other sporting activities could be just over the horizon with the advent of new, low-density structural materials and advances in design techniques. This, at least, is the conclusion of one review of the theoretical and practical considerations involved in man-powered flight. Circle number 550

Development tooling and parts may be optically formed using a photosensitive plastic. Intricate, precise, three-dimensional configurations can be produced quickly and economically by photographic techniques. The process and some applications in development-shop support of engineering activities are described. Circle number 551

HOUSEHOLD AND INDUSTRIAL WASTES can be converted into potentially useful solids, liquids and gases without adding to environmental pollution. The technique employs destructive distillation processes originally developed to determine the yield and quality of products from coal. The energy from the gas produced is more than sufficient to provide the heat for pyrolysis. Circle number 552

The use of "SOLAR RUGS" floating on helium mattresses above our major cities has been suggested as a method for reducing the critical electrical peak power shortage in the U.S. without adding further to the atmospheric and surface water pollution. Calculations show that a square-mile mattress 100 ft thick can support 10,000 tons at 53,000 ft elevation, sufficient to provide for a manned solar energy station capable of producing over 250,000 kw of electrical power during the daylight hours. Circle number 553

PHOTOLUMINESCENT MATERIALS coated onto a viewing screen enable the conversion of monochromatic blue or ultraviolet laser beams into virtually any visible color, while at the same time eliminating the unpleasant granular texture associated with direct viewing of diffusely scattered coherent light. Various schemes for producing black and white and multicolor displays are discussed in two papers. Circle number 554

The realization of low-cost, reliable, closed-cycle helium refrigerators will open the door to a wide variety of applications of superconductivity. A general review of current practical and proposed applications of the properties of superconductors was undertaken in a NSF-supported study, and the results are presented together with extensive references to the literature. Circle number 555

A comprehensive study has been made of problems relating to transportation noise pollution. The investigation examines projected transportation trends for the next 15 years and the resulting impact on the noise environment, legal and political aspects of the noise problem, and the recommendations for controlling transportation noise pollution. Circle number 556

A method for real time infrared diagnosis of auto tires has been developed which is capable of detecting defects as small as 0.5 inch square at speeds of 60 mph. Pattern recognition of standard tire defects was "learned" by examination of specially prepared tires having built-in or known type defects. Circle number 557

Possible applications of electrofluids—fluids that are viscosity sensitive to the presence of an electric field—is the subject of a report, which has recently been made available for wider dissemination. The study is concerned with the feasibility of utilizing and improving the properties of electrofluids. Circle number 558

An examination of the frontiers of laser development focuses upon various efforts to provide more power, narrower linewidths, and greater tunability. Supersonic gas flow, organic dyes, and chemical reactions are among the systems under investigation to achieve these goals. An excellent review of some of the results of 12 years of laser research is presented. Circle number 559
We welcome the opportunity to provide the information you have requested from WESRAC. We trust it will be useful to you.

Attached is additional information which describes more fully how you may avail yourself of the full spectrum of WESRAC services. These include Retrospective or Current Awareness Searches, and over 800 Computer Software Programs.

For additional information on service, direct contact can be made with WESRAC by mail, telephone or personally.

We look forward to working with you.

Sincerely yours,

John Wolcott

JW:jch

Enclosures
lems. Searches may be undertaken and charged on an individual basis or on one of three annual retainer plans. The latter offer substantial cost savings.

**CURRENT AWARENESS SEARCH OPTIONS**—For those concerned primarily with the task of remaining intimately informed of current developments in one or more areas of research, WESRAC offers two kinds of services. One of these—Customized Current Awareness—provides highly selective monitoring and monthly reporting of developments in areas of special interest to the client. Such surveillance is often undertaken as a follow-on to specific retrospective searches. The other current awareness service provides monthly reporting of developments in numerous pre-selected areas of technical and managerial interests. More than 70 "Standard Interest Profiles" are available on such topics as: High Temperature Materials, Non-Destructive Testing, Air and Water Pollution, Laser Developments, Display Systems, Information Science, and Management Information Systems.

**COMPUTER SOFTWARE LIBRARY**—Over 800 software programs, developed in industry, government and academic institutions, are currently available through WESRAC at a small fraction of their development cost. These programs answer a wide variety of needs in research, analysis, design, production and inventory control, simulation and modeling.

**STATE-OF-THE-ART SYMPOSIA**—WESRAC occupies a virtually unique position at the crossroads of technology transfer. From this vantage point, WESRAC is able to monitor emerging technological needs as well as capabilities and to identify areas of significant overlap. From time to time WESRAC sponsors or co-sponsors symposia on topics of special interest and in which noteworthy progress has been made.

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**WESRAC**

**WESTERN RESEARCH APPLICATIONS CENTER**

**UNIVERSITY OF SOUTHERN CALIFORNIA**

809 WEST 34TH STREET, LOS ANGELES, CALIFORNIA 90007

TELEPHONE: (213) 746-6132   TWX: 910 321 2981
WESRA IS A NON-PROFIT RESEARCH AND TECHNOLOGY UTILIZATION CENTER at the University of Southern California which operates in close cooperation with the National Aeronautics and Space Administration and other public and private institutions.

WESRA'S FUNCTION is to assist individuals in industry and public organizations to find effective solutions to technological problems and expand their knowledge in technical areas by:

1) helping them to clarify and precisely formulate their needs;
2) conducting systematic, computer-aided searches of past and current literature—from private and government sources and the English and foreign language press;
3) providing technical support in making effective use of the acquired information.

WESRA UTILIZES THREE KINDS OF RESOURCES:

1) TECHNICAL STAFF—The search for solutions to technological problems requires an intimate understanding of those problems. WESRA draws upon a diverse group of highly trained scientists and engineers who are skilled in the use of sophisticated information tools and experienced in the art of technology transfer. One of these specialists works closely with the client on each project.

2) RESEARCH AND TECHNOLOGY DOCUMENT COLLECTIONS—WESRA has access to more than fifty files and bibliographic services relating to all areas of science and technology, management, education, and socioeconomic research. Some of these collections are broad-based, e.g., the NASA and GRA (Government Research Announcements) collections. Others have a more specialized focus, as for example: ERIC (Educational Resources Information Center), Chemical Abstracts, and Air Pollution Abstracts. More than 20,000,000 documents are included in these collections, with more than 40,000 new items added each month.

3) COMPUTERIZED INFORMATION SYSTEM—WESRA utilizes an IBM 360/30 computer to automate the search process. The system provides both batch processing and on-line, interactive access to the data base.

In the batch process mode, many searches, dealing with different subjects, are conducted in parallel, i.e., simultaneously. A search strategy, unique to each problem, is formulated by the technical specialist, reflecting his understanding of the problem and knowledge of the indexing languages used in filing the information. The strategy may define a relatively broad or narrow search—depending on the nature of the problem and the specific information desired—and it may specify a more or less extensive retrosearch of past publications. The results of the computerized search are screened by the specialist for their relevance to the problem, and a report is prepared citing items that have both direct and peripheral significance.

The on-line mode provides direct communication between the specialist and the computer and enables an instantaneous, exploratory probe of the data base to determine what kind and how much information is available in a given subject area. Such probes are useful in formulating search strategies, as well as identifying documents of particular interest.

WESRA PROVIDES THESE SERVICES:

TECHNOLOGY INTELLIGENCE PROGRAM—Technology intelligence—the search for solutions to immediate problems and the on-going quest for new opportunities—requires continuous, professional surveillance. Technology intelligence, like planning, cannot be undertaken effectively in a piecemeal way.

WESRA's Technology Intelligence Program is designed to provide customized problem-solving and intelligence support for business, local government, and research organizations. The program offers a systematic approach for continuous selective monitoring of those developments in science, technology and management which are of special interest to technical and managerial personnel. Moreover, it facilitates effective search for solutions to specific technological problems by establishing a close, working relationship between professionals in the field and their counterparts at WESRA.

The specific nature and extent of intelligence needs are determined at the outset and periodically reviewed. This systematic and detailed profiling of areas of interest and activity provides not only a basis for technology intelligence, but a valuable input to planning and decision making. The Technology Intelligence Program is available on an annual retainer basis.

RETROSPECTIVE SEARCH OPTIONS—Several options are available for those organizations who do not choose to initiate a Technology Intelligence Program but who have need for assistance in solving specific technological prob-
The following is an abstract of the document pertinent to the subject in which you have expressed interest.

A FLUIDIC SYSTEM FOR MIXING TWO FLUIDS:
DEVELOPMENT STUDY
D. Pal Feb. 1971 28 p. refs
(AD-722316: NCEL-TN-1150) Avail: NTIS CSCL 13/7
Results of a study on the use of proportional fluid amplifiers for the mixing of two fluids are presented. The system proposed is considered capable of mixing fluids in varying mixture ratios. For this application, the fluidic device promises to be superior to conventional mechanical flow modulating devices. The fluidic mixing system being tested uses a double leg elbow amplifier and is designed for mixing hot and cold water. Author (GRA)

Copies of the full report may be obtained from WESRAC at cost plus a small service charge. (see enclosed order form)

A spot check of recent additions to WESRAC's technology collections has shown that much more information covering the same general field is available. We attach as a sample four additional abstracts; copies of the full reports may also be obtained from WESRAC. (see enclosed order form)

An extensive computer RETROSEARCH of the WESRAC collections in this or other areas of interest, using a strategy tailored to your individual requirements, may be undertaken upon request. (see enclosed brochure)

Also, MONTHLY UPDATE reports of new additions to the literature in your specified area of interest are available.
N71-20892# Joint Publications Research Service, Washington, D.C.
TESTING UNIT FOR INVESTIGATION OF ELECTROMAGNETIC MIXING OF MELT DURING ZONE RECRYSTALLIZATION
Avail: NTIS
A test stand, designed for full scale and model analysis of the mixing of a melt by the traveling flat electromagnetic field of a mixer of the electromagnetic track type during zone recrystallization, is described. The test unit consists of: inductor power source; flat traveling electromagnetic field inductor; coordinator; quartz ampule; gas vacuum distributor; inert gas cylinder; vacuum assembly; and shelves with measurement instruments. The mixing modes were investigated on model materials of gallium and indium, and on full scale materials of bismuth and indium antimonide.
A.L.

N71-10525# Technische Univ. Berlin (West Germany). Fakultät für Bergbau und Hüttenwesen.
STIRRING EFFECTS ON MULTIPLE PHASE MIXING BEIFLUSSUNG DES MISCHENS MEHRERER PHASEN DURCH RUHREN
Ulrich Bmler (Ph D Thesis) 1968 94 p refs In GERMAN
Avail: NTIS
* The effects of various stirring methods on mass transfer in gaseous-liquid, liquid-liquid, and gaseous-liquid-solid systems are determined for conditions comparable to pressure leaching in autoclaves. Considered are suction absorption mixers and the use of ultrasound waves for accelerating mass transfer flow.
Transl by G.G.

A REVIEW OF FUNDAMENTAL EQUATIONS OF THE MIXTURE OF A GAS WITH SMALL SOLID PARTICLES
S. I. Pai Aug 1970 60 p refs (Grant NGR-21-002-258)
(NASA-CR-117309; BN-668) Avail: NTIS CSCL 20D
The flow of a mixture of a gas and small solid particles and the solid particle behavior in the mixture are considered. The fundamental equations of the mixture of the gas and the pseudo-fluid of solid particles are derived from both the continuum theory point of view and the simple kinetic theory point of view. Relations between these two points of view are given and discussed by comparing the corresponding terms. Finally discussed are two simplified cases of the fundamental equations which consist of: (1) the thermodynamics of the mixture of solid particles and a gas; and (2) the case of negligibly small volume fraction of solid particles.
Author

N71-10757# Auburn Research Foundation, Inc., Ala.
SHEAR MODULATED FLUID AMPLIFIER Patent
Sponsored by NASA
The fluidic high pressure hydraulic amplifier is composed of a fluidic vortex amplifier as a power stage and a vortex shear modulator as a pilot stage. The vortex amplifier's control stream input is modulated by the vortex shear modulator which has an input of much lower pressure. The modulation is accomplished by the shearing or deflecting effect of the vortex shear modulator on the supply jet within the venting gap between a power nozzle and a jet receiver. The low pressure input of the vortex shear modulator controls the larger pressure of the hydraulic control stream of the vortex amplifier. The amplifier in turn controls the final hydraulic output of the vortex amplifier from zero to a given high pressure. The initial low pressure input may be hydraulic or pneumatic and it may be single or multiple.
Official Gazette of the U.S. Patent Office
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As a result of the Random Walk column in Design News, WESRAC had the privilege of providing you with specific information. This may have been a mini-search, a document, or merely information about the resources available to you through WESRAC.

In an effort to determine the usefulness of this material, we would appreciate your comments and suggestions. For your convenience in replying, a prepaid post card is enclosed. Please check the appropriate items on it to guide us in future responses to inquiries such as yours. Any comments will be welcomed.

Your prompt response will be appreciated.

Sincerely yours,

A. Kendell Oulie
Director

Enc.: Brochure, Post Card
jw;gs
December 1971 Newsletter
January 1972 Newsletter
WESRAC

Re: Design News' Random Walk Response

The additional information I received:

Was very helpful ______ Had some value ______

Did not help me ______

WESRAC service looks valuable and I hope to use it some time: YES _____ NO _____

Comments, if any: __________________________________________

_________________________________________________________

_________________________________________________________

Date ____________________
Continued... all you have to do is circle number 12-1 on the reply card provided and return it to us. We should point out, in passing, that the front page of subsequent issues of TI will deal with developments which are likely to have broad and extraordinary impact.

And finally, from time to time we will advise you of new services and forthcoming seminars and conferences offered or sponsored by WESRAC and affiliated organizations.

The criteria and procedures for selecting items for capsule reporting in Technology Intelligence may be of interest. Basically, we are searching for developments which either significantly extend the potential of existing technologies, or point toward the emergence of new fields of activity. Computer strategies reflecting these criteria have been developed to facilitate a coarse screening of the tens of thousands of reports that are added each month to WESRAC's technology collections. The results of the machine search—including several hundred citations—are then examined by individuals representing a diversity of expertise and experience, and a dozen or so of the most interesting of these reporting are selected for TI.

Much is left unsaid of course in this overview of the process, but that in essence is how we uncovered the document relating to flying bicycles, as well as the other items appearing in this first issue of Technology Intelligence.

All of this presupposes that you have some familiarity with WESRAC and its reasons for existence. Whether you are an old friend or a puzzled newcomer on our mailing list, we invite you to read our new brochure (attached) which briefly describes the nature of our operations and services. We hope that the few minutes of your time invested each month in TI will prove to be rewarding.

Flying Bicycles Item 12-1

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University of Southern California

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12-1 12-4 12-7 12-10

12-2 12-5 12-8 12-11

12-3 12-6 12-9 12-12

Flying bicycles for competition and other sporting activities could be just over the horizon with the advent of new high-strength, low-density structural materials and advances in design techniques. This, at least, is the conclusion of one review of the theoretical and practical considerations involved in man-powered flight.

Not everyone of course will find the prospect of flying bicycles intriguing, either in terms of personal interest or potential business opportunity. Still, it signals an extraordinary development in our technologically oriented culture, and it is with such signals of change and emerging opportunity that WESRAC's new monthly publication, Technology Intelligence (TI), is concerned.

Given another medium and a different aim, we might talk at length about the nature of change in our world, but time—yours as well as ours—fortunately does not permit that. Indeed, that is one of the central purposes of Technology Intelligence: to help you remain informed about fundamental technological developments with a minimum of demand upon your time.

The format and style of TI reflects the spirit of this objective in a number of ways. First, we have sought to keep paper and words to a minimum...a worthwhile contribution, we think, toward dealing with the "paper explosion."

Second, we are trying to say a lot with a few words about a wide variety of developments which may be of interest to scientists and engineers, and those who are responsible for the management of technical operations.

Third, we are striving to make it easy for you to obtain additional information about those developments which interest you by providing a self-addressed reply card. You may, for example, wish to learn more about the technology of man-powered flight. If so,
CAPSULE ANNOUNCEMENTS

Development tooling and parts may be OPTICALLY FORMED using a photosensitive plastic. Intricate, precise, three-dimensional configurations can be produced quickly and economically by photographic techniques. The process and some applications in development-shop support of engineering activities are described. Item 12-2

Investigation of biological propulsion systems using fish and water-channel models has led to the development of a NOVEL PROPULSION SYSTEM EMPLOYING OSCILLATING FINS. Five models have been investigated: 1) a plate propeller for ship propulsion in shallow water and for towing; 2) a propeller for pumping sludge; 3) an engine arrangement behind the fuselage for using the energy accumulated in the boundary layer; 4) low-drag fuselage shapes; and 5) underfloor installation of propulsion units in the fuselage of VTOL aircraft. Item 12-3

A Russian publication discusses the theory and operation of AIR CUSHION VEHICLES and the application of the ground effect in industrial transportation. Off-highway ACVs and air cushion assisted trailers for hauling heavy machinery are described. English translation available. Item 12-4

Efforts to develop a discrete element MAGNETO-OPTIC DISPLAY SYSTEM are reported. The device is basically an electronically controllable diffraction grating which, by controlling the orientation of the grating at selected points, diffracts light toward an observer. The report includes an evaluation of the system under investigation and discussion of optical, electronic, and memory aspects of magneto-optic display. Item 12-5

The ELASTIC SURFACE TRANSFORMATION (EST) is a new signal processing and display technique that permits the observer to manipulate and enhance marginal signals. Information from an electron-optical sensor is photographically transferred to a uniformly prestretched surface which is then allowed to contract to produce a special compression of the prestretched surface. During contraction the size of the elements on the surface remains constant, but their density increases. Finally, the compressed image is optically magnified to its original size, with a resulting enhancement in image contrast and pattern perception. Item 12-6

SOLUTIONS TO TEMPLATE LAYOUT PROBLEMS may be obtained with the aid of a computer. A dynamic programming algorithm has been developed which encloses irregular shapes, singly or in combination, in minimum area rectangles or modules. The algorithm converts the multivariable problem into a multistage one. Successive iterations of the algorithm are used to determine whether higher order modules (containing more irregular-shaped pieces) improve the solution. Item 12-7

A mathematical model has been developed to assist management in the EVALUATION AND SELECTION OF POTENTIAL R&D PROJECTS. The model is composed of 1) a project evaluation module that utilizes the concept of discounted cash flow to derive an index of expected net present value (ENPV) for each project; and 2) a project selection module that utilizes a linear programming algorithm to select the set of projects that maximizes the total ENPV, while satisfying specified budget constraints. The system is presently being used as a tool in R&D decision-making. Item 12-8

NOISE affects man’s state of mental, physical and social well-being; it may be thought of as a special form of air pollution. A comprehensive survey has been undertaken to determine the present status of noise pollution, its sources, effects, and methods of control. Many urgent research needs are also identified. Item 12-9

SOLID-PROPELLANT COOL-GAS GENERATING SYSTEMS may be used in a wide variety of applications. In a typical cool-gas generating system, the deflagration of the solid-propellant grain produces a driving force which mixes and cools the propellant gas with the refrigerant gas. Ambient air is injected into the gas system, and the result is a cool and non-toxic gas mixture. The report discusses the use of such systems for inflating emergency escape slides, rafts, pontoons and flotation bags. Item 12-10

The problem of MACHINE REPLACEMENT IN A CHANGING TECHNOLOGICAL ENVIRONMENT has been examined in terms of modern control theory. The approach aims at the development of a policy which permits simultaneous optimization of preventive maintenance and replacement of machines. Control is effected by varying the length of the replacement cycle and the schedule of preventive maintenance. Item 12-11

Technology Intelligence is published monthly by the Western Research Application Center, a non-profit center for technology utilization at the University of Southern California. WESRAC utilizes the resources of the National Aeronautics and Space Administration and other public and private institutions. More information on items appearing in TI may be obtained by circling the appropriate number on the reply card (below) and returning it to WESRAC. Tel: (213) 746-6132

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LOS ANGELES, CALIFORNIA 90007
als in a group are especially effective in these roles and function as "technological gatekeepers." (We think it important to point out, in passing, that the members of WESRAC's technical staff are professional technological gatekeepers and can materially assist your R & D programs by helping to define problems, find solutions and identify new technological opportunities. Such support, we might add, can be particularly helpful in smaller organizations operating with limited technical staff and library facilities.)

The other two roles with which Farris is concerned have to do with the promotion and implementation of new ideas within an organization. The "power equalizer" role consists of activities on the part of one individual to insure that another's ideas get a fair hearing or that competing ideas are not adopted prematurely. And a scientist or engineer functions in an "organizational link-pin" role when he helps an associate to obtain needed resources and facilities.

On the basis of these ideas, Farris and his colleagues undertook a study of role nets in a NASA research center. Their findings provide valuable insight into the workings of research and development groups and are suggestive of ways to enhance R & D productivity.

For More Information Circle Item 1-1

This brings us back to the general subject of R & D productivity. We believe that this subject is of timely and widespread interest and we are exploring the possibility of sponsoring a symposium on FACTORS AFFECTING R & D PRODUCTIVITY. Would you be interested in attending such a conference? If so, please let us know by circling Item 1-1a on the reply card or, better, drop us a note. We would welcome your suggestions. Item 1-1a

The subsystem for generating new and better ideas, products and processes in an organization—the research and development group—has itself become the subject of considerable scientific interest. Much has been written on the subject of technological creativity and problem-solving, both as an individual and group activity. Still more study has been directed toward understanding the organizational aspects of executive decision making. Past investigations have sought to develop (1) models of individual processes of inquiry, (2) theories of group decision making based on the results of experiments in the psychological laboratory or formal meetings in organizations, and (3) case studies of decision making in organizations. While each of these approaches has provided useful insight, none appears to be capable of leading to a generalized understanding of the processes involved.

A fresh approach to this problem has been advanced, which examines the nature of the informal organization considered as a network of various kinds of relationships among its members. These "role nets" are seen as the basic units of the organization, reflecting ways in which things are actually accomplished.

These ideas are developed in a recent paper by George F. Farris of the Sloan School of Management, Massachusetts Institute of Technology. Farris and his associates have identified four principal "colleague roles" which serve to stimulate the work of scientists and engineers in R & D groups.

Two of these—the "thinking facilitator" role and the "technical link-pin" role—are mainly concerned with the way in which ideas are generated. The former consists of activities by which one individual helps another to identify and clarify important problems, while the latter has to do with the assistance provided a colleague in locating relevant technical information. Certain individu...
CAPSULE ANNOUNCEMENTS

SCHOLAR is a prototype system capable of true MIXED-INITIATIVE MAN-COMPUTER DIALOGUE. The system is not only capable of answering questions in relatively unrestricted natural language, but also of generating questions, analyzing responses, and producing reasonable consequent actions. Recent advances in inference-making capabilities and use of graphic communication are among the topics discussed.

VOLUME HOLOGRAMS IN PHOTO-POLYMER MATERIALS require no processing and are capable of producing bright, low-noise images. Materials sensitive to both UV and blue-green radiation have been used. The mechanism of hologram formation in such materials is examined and experimental results on sensitivity, spatial frequency response, particle scattering noise, and nonlinearities are discussed. Some holographic applications of the material are presented.

A BIBLIOGRAPHY ON AUTOMATION, TECHNOLOGICAL CHANGE AND STATUS OF THE FUTURE has been assembled. The list of more than 1,200 titles covers a wide range of topics and investigations.

A ONE-MAN AIR CONDITIONER has been developed to enable individuals to function in heat-stress environments. The report describes experiments with conduction head-cooling units which combine the best features of four previous designs.

Results of a study on the use of PROPORTIONAL FLUID AMPLIFIERS FOR THE MIXING OF TWO FLUIDS are presented. The proposed system would be capable of mixing fluids in varying mixture ratios and with certain advantages over conventional mechanical flow modulating devices. The system being tested uses a double leg elbow amplifier and is designed for mixing hot and cold water.

A comprehensive survey has been made of the PRESENT STATUS OF ADAPTIVE CONTROL AS APPLIED TO ALL TYPES OF MACHINING PROCESSES. Included is a bibliography of 499 references, a summary of 15 plant visits, and the results of a widely circulated questionnaire. Areas of needed R & D effort are identified.

An integrated study of EARTH RESOURCES IN CALIFORNIA USING REMOTE SENSING TECHNIQUES is reported. The study is concerned principally with the California Water Project and with a variety of socioeconomic and environmental factors as well as hydrologic parameters associated with the demand for and supply of water.

FLUIDIC GYROSCOPES, characterized by the reduction or elimination of mechanically moving parts, may provide superior performance in certain applications. They are immune to severe vibration and acceleration, unaffected by nuclear radiation and electromagnetic force fields, and are light-weight and have low cost potential. An examination of the current status and future of fluidic gyro technology is presented.

A HYBRID HEAT ENGINE/ELECTRIC PROPULSION SYSTEM has been studied to determine the potential of such systems for reducing air pollution from the exhaust of street operated vehicles. In this concept, a combination of heat engine and batteries serves as the power source. Several kinds of heat engines and batteries were considered for various classes of vehicles. Estimated exhaust emissions and vehicle costs are presented.

WHAT ARE THE PROSPECTS FOR REPLACING HUMAN JUDGEMENT WITH STRICTLY RATIONAL AND LOGICAL TECHNIQUES in managing our complex human systems? This question is explored in a thought-provoking manner by a leading scientist-mathematician. After examining the capabilities and limitations of computers, control theory and other formal tools, he concludes that "only the human mind can cope with human problems."

科技情报研究会每月由西部研究应用中心发布。该中心是一个非盈利自然科学技术利用的环境在南加州大学。WESRAC利用资源的国家航空航天局和空间管理以及其他官方和私人机构。更多关于出现的TIA可以由在下图插图的数字上，然后寄给WESRAC。电话:(213) 746-6132
Special Libraries Association
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1971 Membership Directory

Wall Street Journal, September

Fortune Magazine, California Metro Edition, January
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WESTERN RESEARCH APPLICATION CENTER

University of Southern California
809 West 34th Street
Los Angeles, California 90007
746-6132
WESRAC's Technology Brokerage is open for business.

Yours.

WESRAC is the Western Research Application Center of the University of Southern California. Our role is to help you find answers to any technological problems your business is faced with.

More specifically, WESRAC is a non-profit technology dissemination center in USC's Graduate School of Business. We're what you might call a Technology Brokerage Center, created to help business by providing access to a wide variety of informational sources. The whole idea is that you don't have to spend time, effort and money in "do-it-yourself" technological research. The chances are excellent that someone somewhere in the world has already solved a problem facing you now. And WESRAC's job is to help you find that solution, and put it to work.

NASA, for example, has spent over $35 billions in research projects covering every conceivable subject. These findings, which are available to the public, are just one of WESRAC's sources. We have the Department of Defense files, we have COSMIC's data bank, we have reports from foreign research sources. We have over a million technical journals, articles and published papers detailing private research programs throughout the world... and we add 6000 new documents to our collection each month.

We'll search through these vast resources of ours to find answers to your problems. We'll also have our engineering and scientific specialists help you interpret the answers, and translate them into workable solutions.

In the age of the Information Explosion, you could hardly be expected to keep abreast of the developments occurring within your field of interest. WESRAC can, and does.

Consider WESRAC as a full-time partner of yours. We'll keep you continually up to date on the latest technology intelligence. We'll help you locate answers to today's and tomorrow's technological questions. We'll send our specialists to help you. We'll do all this for a fraction of the cost you'd spend to do it using your own resources and people.

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On the coupon below, indicate your business field. Attach the coupon to your letterhead, and mail it to us. We'll get back to you with categories covering what's being done in your field, where to look for the information, and how much it will cost to look for it.

Our business is to help yours. The way we see it, that's what a Technology Broker is for.

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University Park, Los Angeles, California 90007

Gentlemen:
My business is in the field of _______________________
Please send any information you have relative to my field of interest to:
Name ___________________________________________
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NASA\USC combine to offer technology intelligence in ten days—or less.

Why is this statement important to you?
Because it can make money for you or save it. It can save you time. It can help your technical people begin a project where others have left off. It can save costly experimental work. It may even reveal a finished product which exactly fits your needs. It can help avoid duplicating work already done by others. It can solve the near impossible problem of keeping up-to-date despite the overwhelming technology and information explosion.

What is WESRAC?
WESRAC (Western Research Application Center) is a non-profit technology dissemination center established by NASA and the USC Graduate School of Business Administration. Its purpose is to provide efficient access to an extremely wide range of technological developments. These have been indexed on computer tape or in journals. This rapidly growing collection includes work done on R&D, products, computer programs, manufacturing and management techniques, medical developments and other vital fields.

How does WESRAC work?
WESRAC uses specialists to help you define your questions closely in your fields of interest, e.g., engineering, medicine, science and business. These specialists are drawn from University and WESRAC sources. They understand your fields of interest. They write the strategy for a computer search and select appropriate sources. They help you decide whether or not to search. They screen the findings and in 3 to 10 days give you a specific response and tell you why it applies. WESRAC professionals maintain a close working relationship with your professionals.

Is Profit a factor?
Profit is important to you and your profit is critical to WESRAC. While WESRAC is non-profit and has no commercial interests, its success depends upon serving your needs. Your proprietary rights are protected at WESRAC, but you have access to work done at government agencies and by private companies under government contracts.

What are some of the resources? Are they current?
WESRAC has the full resources of a leading University—engineering, medical, scientific, business, special fields and libraries. WESRAC has the complete worldwide collection of ideas and innovations generated by the NASA Space Program. There are almost a million reports indexed and cross-indexed on computer tape for easy, quick, accurate retrieval. About 6,000 reports are added each month. WESRAC also has many other computerized collections and specialized sources. It can also provide access to work being done but not yet published. WESRAC has computerized information resources that cannot be duplicated in the West.

What is the Technology Intelligence program?
TIP gives you continuous reporting on developments in your specific fields of interest. This professional surveillance provides a systematic approach to selective monitoring of those developments in science, technology and management which are of interest to technical and management personnel.

Who needs WESRAC support?
With some 20,000 subjects, it is almost impossible for an individual to pick an area in which there is not new material. The project manager, the president, the manufacturing manager, the librarian, engineer and scientist, the new products man with an idea, the civic administrator, ecologist and the members of the medical world all find help. This support ranges from the most fundamental to the most advanced.

What does it cost to use WESRAC?
Costs depend upon the amount and nature of service required. No matter how complex your problem, WESRAC costs are always substantially less than similar work which you might do yourself. WESRAC can be your complete technical information source, or it can provide individual searches on special subjects. It can bring you up-to-date in a new field of endeavor and provide background for proposals. In any case, there is no charge to evaluate your need.

WESRAC finds answers

WESRAC (Phone 213-746-6132)
University of Southern California
809 W. 34th Street, Los Angeles 90007

Please tell me how my Technology Intelligence needs can be answered by WESRAC.

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An advertisement in FORTUNE's January, 1972 California Metro Edition
Technology Transfer Letter, March

Computer Software Letter, August
  NASTRAN Abstract and Program Capability Abstract

NASA Tech Brief Letter, August
  Response Card
  Wall Street Journal Reprint

Technical Support Package Follow-up Letter, December
  WESRAC Brochure
  Computer Software Brochure
Through NASA in Washington we have learned of your request for information concerning the article "Tune in to NASA's Technology-Transfer Program" which appeared in the December issue of Plastics World. As a result of your request, we understand you were sent a number of recent "Tech Briefs" concerned with plastics, together with some information on NASA's Technology Utilization Program.

We are writing to tell you that NASA's Technology Utilization Division has a Regional Technology Dissemination Center in Los Angeles at the University of Southern California. This RDC, the Western Research Application Center (WESRAC), has a fully-staffed unit, complete with not only the NASA data bank indexed for computer searching, but also the Department of Defense collection and several other important technical data banks. Here, with the help of engineering specialists and programmers, WESRAC has the capability of searching and retrieving a vast amount of material in your area of interest quickly, efficiently, and economically.

Because WESRAC is furnished much of its basic material from Federal sources, we can provide you with an individually-planned data search at a fraction of actual cost. Over a million technical documents in our collection are as available to you as your telephone. Just call or write us at (213) 746-6132, WESRAC, University of Southern California, 809 West 34th Street, Los Angeles, California 90007.

Sincerely,

A. Kendell Oulie
Director

AKO:pty
Dear Sir:

WESRAC is a Regional Technology Dissemination Center for the NASA technology collection, as well as a number of other collections which are indexed and cross indexed for computer retrieval. This is a national resource and as a result WESRAC has become a prime center for technical knowledge in the West.

An expanding part of our collection is the Computer Software Programs section. (These are described in the attached brochure.) To date over 800 programs have been validated and are now available. One example, NASTRAN (NASA STRuctural ANALysis), a program designed to analyze the behavior of elastic structures, has become an extremely popular release.

Although the development expense of these programs is many millions of dollars, they can be obtained from WESRAC at only the cost of reproduction and distribution. As an example, a program that may have cost $100,000 to develop, may cost as little as $100, when obtained from WESRAC.

References and abstracts of these programs are listed in Computer Abstracts. While the supply lasts, one volume of this index will be sent to you without cost, at your request. To obtain your free copy, merely return the enclosed card.

Should you have any questions regarding any aspect of the program, please call me.

Very truly yours,

A. Kendell Oulie
Director

AKO:JFW
SUMMARY OF NASTRAN PROGRAM CAPABILITY

A wide range of analysis capability has been built into NASTRAN as indicated in Table 1.

Table 1 - Summary of Program Capability

RIGID FORMATS

Static Analyses
Basic static analysis
Static analysis with inertia relief
Static analysis with differential stiffness
Piecewise linear analysis of nonlinear static response

Elastic Stability Analysis
Buckling

Dynamic Analyses
Normal mode analysis
Transient response, modal method
Transient response, direct integration method
Frequency and random response, direct integration method
Complex eigenvalue analysis, modal method
Complex eigenvalue analysis, direct integration method

DIRECT MATRIX ABSTRACTION PROGRAM (DMAP)

Input
Matrix operations
Restart provisions
Output

It contains programmed sequences of ordered matrix operations termed "Rigid formats" for solving the cases indicated in Table 1 and described below:

Rigid Formats

STATIC ANALYSES

Basic static analysis solves for the response of complex structures to static loads. It yields grid point displacements, constraint forces, element forces, and stresses, as well as yielding weight and balance information and generating structural plots of load deformations.

Static analysis with inertia relief solves for responses to static loads and to inertia loads resulting from steady accelerations. It generates plots of all static load deformations and also yields weight and balance information.
Static analysis with differential stiffness solves for the response to a single loading condition and then determines the differential stiffness effect caused by large nonlinear motion. The simultaneous application of load and differential stiffness effects are applied in increments. This format yields the usual static analysis results for a single loading and then yields displacement, force, and stress information for each increment of the differential stiffness factor. It also yields weight and balance information and generates plots of combined linear and differential stiffness responses.

Piecewise linear analysis of nonlinear static response solves for the response of complex nonlinear elastic or plastic structures to any one static loading. The stiffness matrix is modified incrementally as the loads reach piecewise linear threshold values. It yields accumulated displacements, forces, and stresses at the end of each increment. This analysis also gives weight and balance information and generates plots of deformations accumulated after each linear increment.

ELASTIC STABILITY ANALYSIS

Buckling analysis performs a differential stiffness analysis of a complex structure and then performs an eigenvalue analysis on the pair of matrices consisting of the linear stiffness matrix and the differential stiffness matrix, to determine the value of the load which would cause buckling and the resulting deformation mode. It is equipped to handle only first-order buckling and not post-buckling displacements. It yields displacement, force, and stress information at the threshold load for buckling and also gives weight and balance information and generates plots of buckling modes.

DYNAMIC ANALYSES

Normal mode analysis solves for frequencies and shapes of the natural modes of complex structures. It yields normalized modal, grid-point displacements and constraint forces and normalized modal element forces and stresses. It also gives weight and balance information and generates plots of normalized mode shapes.

Transient response, modal method solves for the response of complex structures to time varying loads in which damping can be either viscous or structural. A real eigenvalue analysis operates on structural mass and stiffness matrices to define generalized modal coordinates. The differential equations are reformulated in terms of modal coordinates in an uncoupled set. Integration is performed by finite differences on the uncoupled modal differential equations. This format yields the time-varying displacements, velocities, accelerations, and constraint forces at grid points and the time-varying forces and stresses in elements. It also yields weight and balance information and generates curve plots of any output quantity against either time or frequency and generates plots of structural deformation at specified instants of time.
Transient response, direct integration method solves for the response of complex structures to time-varying loads in which damping can be either viscous or structural. Integration is performed by finite differences on the coupled differential equations as formulated directly in terms of grid point degrees-of-freedom. It yields the same information described under "transient response, modal method" above.

Frequency and random response, modal method solves two problems in frequency space, performing real eigenvalue analysis on the matrices with grid-point degrees-of-freedom to set up smaller matrices in modal coordinates before doing the following two analyses:

(a) It solves the response of a complex structure, having either viscous and/or structural damping, to a spectrum of steady sinusoidal forcing. It yields the real and imaginary parts of displacements, velocities, accelerations, and constraint forces at grid points and the real and imaginary parts of forces and stresses in elements. These output quantities can be normalized to unity forcing amplitude to form transfer functions. It plots output quantities against frequency.

(b) It solves the response of a complex structure, characterized by the above transfer functions, to stationary random forcing applied in the form of a cross spectral density. It yields the auto-spectral density in that quantity used in the transfer functions, i.e., displacement, velocity, acceleration, constraint force, element force, or stress. It also transforms auto-spectra to auto-correlation functions and plots density functions against frequency and correlation functions against time.

This format also gives weight and balance information and generates curve plots (not structural plots).

Frequency and random response, direct integration method solves two problems in frequency space, but operates on the matrices as formulated directly in terms of grid point degrees-of-freedom. It performs the same two analyses described above under "frequency and random response, modal method" and provides the same information.

Complex eigenvalue analysis, modal method solves for frequencies and eigenvectors of the complex vibration modes of complex structures in which damping can be either viscous or structural. A real eigenvalue analysis operates on matrices with grid point degrees-of-freedom to set up smaller matrices in modal coordinates before extracting complex eigenvalues. It yields normalized complex eigenvectors of grid point displacements and grid point constraint forces, plus complex element forces and stresses, but does not generate complex modal plots. Weight and balance information are also given.

Complex eigenvalue analysis, direct integration method solves for frequencies and eigenvectors of the complex vibration modes of complex structures in which the damping can be either viscous or structural. The com-
plex eigenvalue extraction module operates on the matrices as formulated directly from the grid point degrees-of-freedom. It yields the same information as described above under "complex eigenvalue analysis, modal method."

* * * * * * * *

M71-10009  NAStRAN: NASA STRUCTURAL ANALYSIS, VERSION I

FORTRAN IV (99%), Assembler (1%), 1301 Disc Module and Tapes
IBM 7094/7040 DCS
GSC-10991 Price: Program and Documentation Prices Vary with Options

The behaviour of elastic structures under a wide range of loading conditions is analyzed. Its general purpose nature makes the program usable for structures of any size, shape, class or configuration, any geometric representations which can be identified by any convenient coordinate system, elastic relations which may range from isotropic to general anisotropy, non-linear behavior that can be represented by piecewise linear approximations, dynamic combination with scalar force-producing systems, complex as well as real matrix operations, and structural modeling, vibration frequency and mode determination, synthesis of parts of a structure and a wide variety of loading conditions. The various loading conditions may be concentrated or distributed loads, transient loads, steady-state sinusoidal loads, buckling factors, static thermal profiles, enforced deformations, time-varying as well as static surface and body forces, and stationary Gaussian random excitations. The problems that can be solved are: (1) static structural; (2) elastic stability; (3) dynamic structural; and (4) general matrix problems. The program can handle modules by the force method or the displacement method according to the finite-element approach. Solution results may be plotted on any of three general types of plotters: table, microfilm, and incremental.
Dear Sir:

The NASA Tech Brief program, with which I am sure you are familiar, gives some idea of developments which come from the NASA collection. However, the Tech Brief is only a very small illustration. The complete NASA collection includes almost a million reports on new ways to do both sophisticated and ordinary jobs and includes many new ideas. About 7,000 new reports are being added each month to this data bank alone.

WESRAC here at the University of Southern California has this collection and several others indexed on computer tape for easy, thorough, economical searching. Manual searching of any source is also possible.

Major support is offered our clients by our staff of engineers and scientists who help you define your areas of interest or your problem and who then find answers which match your needs.

The use of this data will help you:

- Avoid and overcome technology obsolescence.
- Avoid duplication of work already done by others.
- Keep abreast of and advance the state-of-the-art in your field of interest.

If you would like to use these services or want to know more about WESRAC, please call or return the enclosed card.

Sincerely,

A. Kendell Oulie
Director
BUSINESS REPLY MAIL
No Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY

WESTERN RESEARCH APPLICATION CENTER
UNIVERSITY OF SOUTHERN CALIFORNIA
GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
LOS ANGELES, CALIFORNIA 90007

809 W. 34th Street
Yes, I am interested in learning more about WESRAC and, in particular, how it can be of service to our organization. I understand there is no obligation.

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE</th>
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<td>COMPANY</td>
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Space Fallout
Data Banks Containing NASA Research Results Help Many Companies

Results of $85 Billion Effort Available at a Low Cost;
Lockheed, Litton Use Files

Building a Better Oscilloscope

By R. A. RUBENSTEIN

The $85 billion effort by NASA to conduct research and development in various fields has led to the creation of data banks which are now available at a low cost to many companies.

The data banks contain results of research conducted by NASA and are available through the Data Storage and Retrieval System (DSRS). The system allows users to search for information on specific topics and retrieve data on a wide range of subjects.

Companies such as Lockheed and Litton have made use of these data banks, which are stored on computer files. Lockheed has developed a better oscilloscope, while Litton has used the data to enhance its own products.

The availability of these data banks has been made possible by the efforts of NASA and has been a boon to many companies looking to improve their products and processes.
As a Technology Dissemination Center at the University of Southern California, WESRAC has become a prime center for technical knowledge in the West. The many sources of information which are available provide a wide range of subjects for computer or manual searches.

The Technical Support package which you received a short time ago briefly illustrates the scope of our NASA technology collection. There are approximately one million reports in this file alone, which is expanding at the rate of 7,000 or more each month. It includes the results of research and development work from around the world. It is cross indexed for rapid, selective retrieval by computer. (The enclosed brochure provides a more detailed explanation.)

Also expanding rapidly is a library of computer software. These programs are available at a substantial savings. The second brochure ("Computer Software Savings") describes this collection.

Staff Specialists representing many disciplines are available to help you define problems and areas of interest and to assist you in analyzing our findings.

Should you desire a no cost analysis of the technical support options available to you from WESRAC, please contact me; or you can use the enclosed search request form to get help immediately on a specific subject.

Very truly yours,

A. Kendell Oulie
Director

Enc.: Brochure
      Computer brochure
      Search request form
      Price sheet
Examples of technology available

AIR AND WATER PURIFICATION — Manufacturing environment, clean room techniques, sterilization.

BIOSCIENCES AND BIOTECHNOLOGY — Performance reaction, physiochemistry, microbiology, ecology, biotelemetry, medical electronics, monitors, data handling, protective clothing.

CHEMISTRY — Electrochemistry, polymer chemistry processes, engineering, photochemistry.

COMMUNICATIONS — Microwave, infrared, light and television systems, telephotometry, telespsychometry, signal processing.

COMPUTERS AND TECHNIQUES — Hardware, software, systems analysis, data management, data processing.

CORROSION — Chemical, galvanic and stress corrosion, materials, detection and prevention.

ELECTRONICS — Semiconductors, transistors, circuitry, microelectronics, feedback and control theory, electromagnetic radiation.

FUEL CELLS AND BATTERIES — Electrochemical, biochemical and regenerative fuel cells; silver cadmium, nickel oxide and other batteries.

GEOPHYSICS — Natural resources, oceanography, geodesy, cartography, geomagnetism, gravitation.

HUMAN ENGINEERING — Engineering devices and equipment to the requirements of man.

HYDRAULIC AND PNEUMATIC SYSTEMS — Components, systems, and instrumentation.

INSTRUMENTATION AND PHOTOGRAPHY — Systems, sensors, transducers, optical, aerial and radar photography and equipment, infrared technology, display systems, data recording.

MACHINE ELEMENTS AND PROCESSES — Bearings, gears, seals, lubrication, machining, welding, forming, quality control and reliability, non-destructive testing.

MANAGEMENT — Management techniques, cost control, production engineering, personnel management, information systems.

MATERIALS — Adhesives, aluminum, ceramics, coatings, elastomers, fiber technology, liquid metals, polymers, plastics, composite metals, high temperature and insulation materials, steel, titanium, refractory metals.

MATHEMATICS, METEOROLOGY, AND NAVIGATION; PHYSICS; PROPULLENTS AND PROPULSION SYSTEMS; SOLID-STATE DEVICES; THERMODYNAMICS AND COMBUSTION.

STRUCTURES — Shells, vibration, impact, fatigue, sandwich construction, testing.

...AND MANY OTHERS!

Add Wesrac to your team
Every-day Application of space age research

Interior House Paint
A company has taken a spacecraft-developed paint and converted it to an interior house paint. The paint can be scrubbed repeatedly without fading, is mar-resistant, and dries in minutes.

Steel Cutting Problem
A steel company had the problem of saw blades rapidly wearing out. Document search revealed information which led to the development of a gas dynamic-nozzle exhaust cutting tool with exceptionally long life.

Electronic Circuits
Three electronic circuits developed by a NASA Center have now been incorporated by a large firm in an ultrasonic testing system designed for its own use.

Dry Lubricant
A progressive company is now marketing bearings coated with a ceramic-bond dry lubricant originally developed for use on a rotating seal in a pump for liquid fluoride propellant.

Welding
A small company had difficulty in welding a contact on a spring, as differential thickness created a severe problem. Information from the Wesrac Bank showed the company how to solve the problem.

Wesrac computerized information retrieval

Retrospective Search  A tailored review of the collection programmed for your special requirements.

Current Interest Search  A monthly update review of all newly-received documents computer-programmed for your exact need.

Wesrac Scans  Citations from a monthly search of additions to the file on many pre-selected popular subjects.

Conferences & Seminars  We bring the people who are creating the research and development together with user companies for discussion and exchange of ideas.

One of Wesrac's major sources is the NASA Data Bank.

Over 6,000 New Documents Monthly are added to this bank alone...

![Results Chart]

**TOTAL U.S. SOURCES** 65%

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<tr>
<td>NASA AND ITS CONTRACTORS</td>
<td>13%</td>
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<tr>
<td>DEPARTMENT OF DEFENSE</td>
<td>13%</td>
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<tr>
<td>OTHER U.S. GOVT. AGENCIES</td>
<td>7%</td>
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<tr>
<td>OTHER U.S. SOURCES</td>
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**TOTAL FOREIGN SOURCES** 35%

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<td>SOVIET Bloc</td>
<td>21%</td>
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<tr>
<td>FREE WORLD</td>
<td>14%</td>
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*Percentages vary from month to month.

Wesrac Service
- Quick — As you need it.
- Efficient — More usable results.
- Economical — Saves time and cost.

![Hand with Text]

USEFUL TECHNOLOGY AT YOUR FINGERTIPS

NEW IDEAS
NEW MATERIALS
NEW TECHNICS
NEW METHODS
NEW PRODUCTS
NEW PROCESSES

Western Research Application Center
UNIVERSITY OF SOUTHERN CALIFORNIA
809 West 34th Street, Los Angeles, California 90007
Phone (213) 746-6132

WESTERN RESEARCH APPLICATION CENTER
UNIVERSITY OF SOUTHERN CALIFORNIA
GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
LOS ANGELES
SPECIAL OFFER from wesrac...

Save valuable time, money, manpower

Here is a graphic illustration of savings gained by using a previously developed software program, versus development costs:

THE EXPENSE OF CREATING A PROGRAM

For more information, fill out and mail this free customer service card.

This questionnaire is designed for your benefit. By knowing your particular area(s) of interest, it is felt that WESRAC can be a better service to you.

For more information, fill out and mail this free customer service card.

This questionnaire is designed for your benefit. By knowing your particular area(s) of interest, it is felt that WESRAC can be a better service to you.
SOME EXAMPLES OF COMPUTER SOFTWARE AVAILABLE FROM COSMIC ARE LISTED IN THE CATEGORIES BELOW

- Operating Systems
- Flowchart Generation
- Language Translation
- Report Generation
- Plotting Subroutines
- Data Analysis
- Linear Analysis
- Integral Analysis
- Geophysics
- Astrophysics
- Aerophysics
- Trajectories
- Standard Mathematical Functions
- Information Storage and Retrieval
- Probability and Statistics
- Differential Analysis
- Engineering Mechanics
- Heat and Mass Transfer
- Structural and Stress Analysis
- Electrical and Electronic Technology
- Electrostatics and Magnetism
- Production, Inventory, and Quality Control
- Communications
- Optics and Sonics
- Chemical Sciences
- Life Sciences
- Nuclear Sciences
- Cybernetics
- Instrumentation
- Analog Simulation
- Management Games
- Measurement Standards
- Operations Research
- Numerical Control
- Automated Design

WESRAC (Western Research Application Center) is a non-profit, computerized technology dissemination center. Resources available to the public through WESRAC include a growing library of computer software programs developed by governmental agencies and collected by the Computer Software Management and Information Center (COSMIC). Programs are accepted from private industry, universities and businesses, as well as from governmental agencies. Thousands of computer programs in all areas of technology, engineering, mathematics, business and industry have been distributed throughout the United States, thus saving expensive and unnecessary wastes of man power, time, and money.
support of the program. By so doing, these agencies further enlarged the concept of making valuable, tax-paid developments available to the public.

The standards for the programs require that they provide the amount of information necessary to inform a prospective user of the precise problem which the computer program is designed to solve. This enables a programmer to input the data, successfully run the program, and obtain the desired results.

To assure that these standards are met, a complex inventory and quality control system has been developed. All documentation and programs received through WESRAC have been evaluated, checked, and validated.

**Documentation** is evaluated by scientists and engineers and checked by program analysts. The specific elements included in each documentation concerning the program are:

1. Description of the problem.
3. Program language.
5. User instructions.
6. Operating instructions.

**Programs** are also checked thoroughly to insure satisfactory use. Any existing errors are corrected and missing routines are added before a program is considered complete. Only source programs are published. The definition of a complete program always includes:

1. Main program.
2. All non-standard (not included with operations systems as normally installed) sub-routines called within the main program or by other sub-routines in the package.
3. All plotting routines called.

Updates to both programs and documentation are checked thoroughly and sent to previous purchasers of programs.

Any United States organization or individual can order programs or documentation by contacting WESRAC.
APPENDIX D

FIREPROOFING AND SAFETY SYMPOSIUM

1. Announcement Letter
2. Brochure
3. Questionnaire (includes response data)
4. Follow-up Letter
   Sample Abstracts from Fire Safety Search
FOR IMMEDIATE RELEASE

Fire Prevention Symposium To Present Distinguished Panel of Authorities

With the spectre of last year's disastrous fires in Southern California lurking as another dry season nears, NASA's Regional Dissemination Center, WESRAC, at the University of Southern California, announces an unusual fireproofing and safety symposium to be held on May 27. Over the last six months, USC's WESRAC facility has been assembling the most authoritative group of experts on fire prevention ever gathered in Southern California. They will report on the newest developments from NASA's laboratories and the most recent experiences of builders, insurance underwriters, chemists and other experts in the field of fire prevention techniques and materials.

A. Kendell Oulie, director of WESRAC, scheduled the May 27 symposium to provide builders, insurance people, apparel and furniture manufacturers, aircraft and safety engineers, property managers, and building engineers with the benefits of NASA's, as well as other independent innovators', newest developments in the materials and techniques of fire prevention. Under the joint sponsorship of the Small Business Administration, NASA and USC's WESRAC, the fireproofing and safety symposium will be held at the Los Angeles Chamber of Commerce.

Because much of today's knowledge about fire dates back only to January, 1967, following the disastrous explosion of an Apollo spacecraft, it has become imperative to disseminate this newly acquired data about fire. Nowhere is this need greater than in Southern California where the annual toll in life and money is rapidly reaching the critical stage.

This important symposium, which has been arranged to fit a one-day session, will be the first attempt to cover the entire spectrum of fire prevention and safety. It will cover the newest discoveries on the chemical anatomy of fire, the role of the Fire Marshal and law enforcement, and the actual new materials currently available for fire protection. These new materials, some to be seen for the first time in California, will be shown at exhibitors' booths outside the meeting hall.
The distinguished group of speakers includes:

Dr. Mathew Radnofsky of the Crew Systems Division at NASA's Manned Spacecraft Center, Houston, Texas, under whose leadership many new materials were developed and tested following the Apollo explosion in 1967.

Dr. Rubin Feldman, president of Thermal Systems, Inc., St. Louis, Missouri, developer of the fire prevention material used on the heat shield for space vehicles.

Deputy Chief Harry Martin, City of Los Angeles Fire Marshal, an authority on fire prevention and safety techniques.

Mr. Myron DuBain, a senior vice-president of property underwriting at Firemen's Fund Insurance Co., San Francisco, California.

Dr. John A. Parker, head of the Chemistry Research Project at NASA's Ames Research Center, Moffett Field, California.

Mr. R. E. Gardner, West Coast technical representative of Koppers, Inc., Pittsburgh, Pennsylvania.

Dr. Melvin Gerstein, associate dean of the school of Engineering at the University of Southern California and former consultant to the NASA Chemical Research group at Ames Research Center.

Dr. Joseph W. Ehrenreich, director of USCRIBE at the University of Southern California of which WESRAC is a part.

Because of the limited seating capacity of the Los Angeles Chamber of Commerce's hall, attendance will be restricted to the first 200 applicants. The cost of a ticket to the full day's meeting, including a steak lunch, is $15. The meeting will start at 9 a.m. at 404 South Bixel Street, Los Angeles. Inquiries should be addressed to:

WESRAC
University of Southern California
809 West 34th Street
Los Angeles, California 90007
(213) 746-6132
SYMPOSIUM PURPOSE:
To help acquaint the business community with new materials and techniques, many of which have been and are being developed and produced as a result of NASA-sponsored research, for improving Fireproofing and Fire Safety with the goal of minimizing fire hazards and reducing costs. The Southern California area is one of the most fire prone regions of the U.S. The many devastating fires to which the area has been subjected in recent years has greatly focused attention and interest on this very serious problem.

FOR WHOM:
1) Construction people and builders
2) Manufacturers of products having a fire hazard or fireproofing requirement
3) Building materials suppliers
4) Fire prevention personnel
5) Insurance underwriters
6) Many others

SPONSORS:
1) USC/WESRAC
2) NASA
3) L.A. Chamber of Commerce
4) Small Business Administration

PROGRAM COORDINATOR:
C. R. Dole, Manager, Engineering Applications, WESRAC, (213) 746-6171
AGENDA

8:30 – 9:15 – REGISTRATION –

9:15 – 9:20
“WELCOME TO SYMPOSIUM”
SPEAKER: Dr. J. Ehrenreich
Director, USCRIBE
University of So. California

9:20 – 9:40
“FIREPROOFING AND TECHNOLOGY TRANSFER”
SPEAKER: A. K. Oulie
Director, WESRAC
University of So. California

9:40 – 9:45
“ANNOUNCEMENTS & PROGRAM OVERVIEW”
MODERATOR: C. R. Dole
Mgr., Engineering Applications
WESRAC / USC

9:45 – 10:15
“INTRODUCTION TO PROGRAM SUBJECT –
FIREPROOFING”
SPEAKER: Dr. M. Gerstein
Assoc. Dean Engr. Sch.
University of So. California

10:15 – 10:30 – COFFEE BREAK –

10:30 – 11:15
“UTILIZATION OF AVAILABLE SKILLS &
MATERIALS IN FIRE PREVENTION”
SPEAKER: Dep. Chf. H. W. Martin
Fire Marshal
Los Angeles, Calif.

11:15 – 11:45
“How to Reduce Your Fire Ins. Rates”
SPEAKER: M. DuBain
Sr. V.P., Prop. Underwriting
Firemen's Fund Ins. Co.
San Francisco, Calif.

11:45 – 12:15 – NO-HOST RECEPTION –

12:15 – 1:15 – LUNCH –
(C of C Dining Room)

1:15 – 2:00
“NEW FIRE RETARDANT FOAMS AND
INTUMESCENTS”
SPEAKER: Dr. J. Parker
NASA / Ames Res. Center
Moffett Field, California

2:00 – 3:00
“OTHER NASA DEVELOPED MATERIALS &
SOME INDUSTRIAL APPLICATIONS”
SPEAKER: Dr. M. Radnofsky
Crew Systems Div.
NASA / Manred Space Center
Houston, Texas

3:00 – 3:15 – COFFEE BREAK –

3:15 – 4:00
“FIRE RETARDANCY USING APPLIED
MATERIALS”
SPEAKER: Dr. R. Feldman
President
Thermo Systems, Inc.
St. Louis, Mo.

4:00 – 4:45
“FIRE RETARDANCY WITH STRUCTURAL
MATERIALS”
SPEAKER: R. E. Gardner
Western States Tech. Rep.
Koppers Co., Inc.
Pittsburgh, Pa.

4:45 – 5:00
“SUMMATION AND WRAP-UP”
MODERATOR: C. R. Dole
**Inquiry on WESRAC Fire Safety and Prevention Symposium**  
**L.A. Chamber of Commerce - May 27, 1971**

**Total Respondents:** 102 = 100%  
79% 12% 9%

1. Did you attend the Fire Safety Symposium?  
   All 81  Part 12  None 9

2. Had you ever heard of WESRAC before you heard of this symposium?  
   No Answer 8  Yes 81  No 63

3. Which three subjects were of most interest?  
   (PLEASE RATE 1, 2, 3, IF POSSIBLE)
   - 19% A 45 Learn about WESRAC capability (Mr. Oulie)
   - 13% B 37 Introduction to fireproofing and safety (Dr. Gerstein)
   - 12% C 44 Utilization of available skills and materials in fire prevention (Chief Martin)
   - 10% D 35 How to reduce your fire insurance rates (Mr. Dubain)
   - 18% E 43 New fire retardant foams and intumescents (Dr. Parker)
   - 16% F 58 Other NASA developed materials and some industrial applications (Dr. Radnofsky)
   - 11% G 50 Fire retardancy using applied materials (Dr. Feldman)
   - 9% H 30 Fire retardancy with structural materials (Mr. Gardner)
   352 = 100%

4. What other subjects would you have liked on the program?  
   (NAME POTENTIAL AUTHORITIES ALSO IF POSSIBLE) 25 = 25%

---

**IF YOU DID NOT ATTEND, PLEASE GO TO QUESTIONS 12, 13 AND 14.**

5. Were personal contacts made at the meeting important to you?  
   N/A 5  Yes 46  No 42

6. Did you learn more, less or about what you expected from the meeting?  
   More 36  Less 16  About What Expected 33  N/A 8

7. What was your principal reason for attending? (MORE THAN 1 IF YOU WISH)
   - 65% 60 To keep up to date in my field of interest
   - 18% 17 Looking for solution to a specific problem
   - 9% 8 Was told to attend
   - 13% 10 General interest
   - 1% 1 It was cheap

8. Was your time well spent in attending?  
   Yes 76  No 6  N/A 12

9. Would more information on any of the subjects be useful?  
   Yes 52  No 24

(IF "YES") Which one(s)? (INDICATE BY LETTERS A TO H USED IN QUESTION 3.)  
**Attached**

---

86
10. What benefits do you think will come from your attendance at the symposium? (MARK AS MANY AS YOU WISH)
   65% [Helped me keep up to date in my field of interest.
   16% [Stimulated basic or applied research.
   8% [Nothing beneficial that I can think of.
   9% [Will help me develop or market a new product(s).
   8% [Will help me develop or market a new process(es).
   12% [Will help me improve existing processes.
   2% [Will increase our income by reducing operating costs, saving us time or increasing sales.
   9% [Other (PLEASE SPECIFY) [Attached]

11. Considering the whole meeting, what was its value to you?
   10.5% [Very little - wouldn't attend again
   15% [Some value but doubt that we'll save or earn more money as a result
   64% [Valuable from a general point of view - well worth the time and money
   10.5% [Very valuable - we expect to put what we learned into a use which will increase our income, improve our competitive position, or save us from losses we would otherwise have

12. What type of an organization do you work for?
   23% [Public utility or governmental
   16% [Research oriented
   10% [Service oriented
   13% [Product oriented
   13% [Other [Attached] [3 double checked

13. What is your position?
   7% [Owner
   24% [Manager
   43% [Engineer, scientist, technician employee,
   7% [Sales, etc.
   19% [Other (PLEASE SPECIFY) [Attached]
   18% [Not Applicable

14. Any comments you wish to make [Attached]

Your name
Title
Organization
Date

PLEASE RETURN COMPLETED QUESTIONNAIRE IN THE ENCLOSED, PRE-STAMPED ENVELOPE. THANX YOU VERY MUCH FOR YOUR HELP.

A. K. OULIE
DIRECTOR, WESRAC
The following is a sampling of representative answers to the Symposium Survey questions which required written comments:

4. What other subjects would you have liked on the program?

   Pacific Rating Bureau, Code programs
   Earthquake design
   Data bank, Image handling, Laser applications
   Firestopping of cable penetrations of fire-rated separations (floors, walls)
   Methods for conducting flammability tests
   Fire detection and alarm systems
   More on home construction problems
   Smoke and toxicity problems and applications

7. Your principle reason for attending (other):

   To meet other manufacturers of fire retardant material
   Misleading in title
   Had a booth at the show
   Looking for contacts for my new product
   Looking for other engineering fields

9. Would more information on any of the subjects be useful? (yes):

   TOTALS:  A. 1  B. 10  C. 6  D. 8  E. 21  F. 14  G. 13  H. 12

10. What benefits do you think will come from your attendance at the symposium? (other):

    Dr. Parker's subject was helpful in improving a process
    Helped us solve a specific problem which presented itself 2 days later
    Good source of information and potential research contacts
    Provided new resources to draw from
    Gave NASA image a broader understanding and appreciation
    Benefit of personal contacts

12. What type of organization do you work for? (other):

    Financial
    Motion Picture Producers' Association
    Insurance
    Air conditioning
    Architecture
    Design and construction refineries
    Walt Disney World, Florida
    Fire Protection
    Lathing and plastering
13. What is your position (other):

Architect
Fire Captain, Bureau of Fire Prevention
Construction Estimator and Inspector
Conservation Rep., Southern California Edison
Safety Director
Code Consultant
Fire Marshal

14. Any comments you wish to make:

Enjoyed entire program - looking forward to future programs
Too much subject matter for allotted time
Saved us from losses we would otherwise have
Too commercial
We have been helped out of a situation which was not apparent when I attended the meeting. Many thanks.
Symposium got me started in a new market; I plan to use WESRAC
Might have been good to include an architect or facilities designer
Superb presentation of modern materials and technology
Some of the presentations were too far removed from the audience
Good for a manufacturer in the field of fire retardants
Well-run program

SUMMARY:

I. The relationship between questions #2 and #3 and WESRAC being of interest:

A. Those hearing of WESRAC who marked it as 1,2,3, ,X in question #3:
   31 heard of WESRAC, 6 marked it of major interest

B. Those not hearing of WESRAC who marked it of major interest in #3:
   63 had not heard of WESRAC, 33 marked it of major interest

II. Overall response to both WESRAC and the Symposium was favorable, but comments were quite diverse depending upon the type of business the respondent represented.
As a follow-up to our Fireproofing Symposium, we have conducted an in-depth search on thermochemical solutions to protecting combustible and non-combustible substrates in high temperature environments.

The National Aeronautics & Space Administration has directly and through well-qualified subcontractors made extensive investigations into practical solutions to this growing problem.

We feel you will be stimulated by some of the provocative methods explored in this report. Copies may be obtained through WESRAC at a cost of $50.00.

Sincerely,

R. Lamon Kelley

RLK:cc enclosures
FIRE RETARDANT PAINT SYSTEMS FOR NUCLEAR SUBMARINE INTERIORS Final Report
The Navy needs a fire-retardant paint for submarine interiors that will release little or no toxic materials into the atmosphere during and after application. The paint should possess good leveling properties so that an attractive surface free of brush marks is obtained, should have a short drying time, and should show good freeze-thaw stability. The dry film should be flexible, should possess good hiding power, and should have a 60 degree gloss between 35 and 50%. A water-based coating system has been developed that should meet these requirements. Such a coating system consists of a fire-retardant undercoat, a decorative topcoat, and the topcoat alone is combustible, but when used in combination with the fire-retardant undercoat, the complete system is self-extinguishing. Although the system will burn when exposed to an extraneous flame or fire, the burning film will immediately self-extinguish when the ignition source is removed or when that part of the film exposed to the fire is consumed. Author (TAB)


A discussion of nonflammable fibrous materials which are to prevent injury and loss of personnel in fires caused by aircraft accidents. Tests for evaluating such materials are discussed taking into consideration flame propagation studies and flame impingement on the fabric surface. Thermal insulation qualities of materials are discussed, and a test procedure that simulates a fire hazard is considered. G.R.


Short abstracts are provided of presentations given at the conference. Subjects covered included: (1) flammability requirements and test techniques; (2) materials development; (3) configuration control and materials applications; and (4) special tests.
APPENDIX E

WESRAC TECHNOLOGY SOURCES

(Partial List)
WESRAC TECHNOLOGY SOURCES

AIR POLLUTION ABSTRACTS
APPLIED SCIENCE & TECHNOLOGY INDEX

BIOLOGICAL & AGRICULTURAL INDEX
BIOLOGICAL ABSTRACTS
BIORESEARCH INDEX
BULLETIN SIGNALETIQUE
BUSINESS PERIODICALS INDEX

*CHEMICAL ABSTRACTS
COMPUTER ABSTRACTS
COMPUTER & CONTROL ABSTRACTS
*COMPUTER PROGRAM ABSTRACTS (COSMIC)

*DEPT. OF DEFENSE DATA BANK (DOD)
DISSERTATION ABSTRACTS

EDUCATION INDEX
*EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
ELECTRICAL & ELECTRONIC ABSTRACTS (LONDON)
ELECTRONICS ABSTRACTS JOURNAL
*ENGINEERING INDEX (EI)

FOOD SCIENCE & TECHNOLOGY ABSTRACTS
FUEL ABSTRACTS

*GOVERNMENT REPORTS ABSTRACTS (GRA)
HIGHWAY RESEARCH INFORMATION SERVICE ABSTRACTS
HIGHWAY SAFETY LITERATURE

*INDEX MEDICUS
INSTRUMENT ABSTRACTS
INSTITUTE OF TEXTILE TECHNOLOGY

LEGAL PERIODICALS INDEX
LIBRARY OF CONGRESS - SUBJECT INDEX

*NASA DATA BANK
*NUCLEAR SCIENCE ABSTRACTS (NSA)
OCEANIC INDEX/OCEANIC CITATION JOURNAL

PESTICIDES DOCUMENTATION BULLETIN
PETROLEUM ABSTRACTS
PHYSICS ABSTRACTS
POLLUTION ABSTRACTS
PREDICASTS
PSYCHOLOGICAL ABSTRACTS

SCIENCE ABSTRACTS
SCIENCE CITATION INDEX
SOLID STATE ABSTRACTS JOURNAL

*U.S. GOV'T. RESEARCH & DEVELOPMENT REPORTS (USGRDR)
U.S. PUBLIC HEALTH SERVICE PUBLICATIONS INDEX

WATER POLLUTION ABSTRACTS
WATER RESOURCES ABSTRACTS
WORLD TEXTILE ABSTRACTS

*Most frequently used Data Sources.

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CD: GS