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AEROSPACE
RESEARCH APPLICATIONS CENTER

FACILITY FORM 602

N69-30957

(ACCESSION NUMBER)

65

(PAGES)

CR-103223

(NASA CR OR TMX OR AD NUMBER)

(THRU)

1

(CODE)

34

(CATEGORY)

AEROSPACE RESEARCH APPLICATIONS CENTER

QUARTERLY REPORT

QUARTERS 1, 2, 3, & 4 - 1968

AND

FIRST QUARTER 1969

NASA CONTRACT NSR 15-003-076

by

**Joseph DiSalvo
Director**

June 10, 1969

Aerospace Research Applications Center

Indiana University Foundation

Bloomington, Indiana 47401

INTRODUCTION

This is a quarterly report for NASA Contract NSR 15-003-076. The period covered by this report includes all four quarters of 1968 and the first quarter of 1969. Although a portion of the time span involved for this report was not covered by the contract, activities and operations of the Aerospace Research Applications Center (ARAC) for the period named above have been detailed in this report in an effort to preserve continuity with previous NASA contracts. In particular the information contained in this report should serve as a follow-on to those quarterly reports issued under NASA Contract SC-NASr-162.

At the end of 1967 the initial period of NASA support for operations and activities of ARAC came to an end as programmed in the original contract issued to ARAC in December, 1962. Throughout most of calendar year 1968 ARAC carried on its operations with client companies primarily with income generated from user fees. Several adjustments in the manning levels and the nature of the ARAC operation had to be made during this period because of budgetary constraints. The effects of this and the other factors are discussed in this report.

Examination of activity level trends presented in this report indicate that the revision of the ARAC fee schedule in 1967 continues to have its impact. As discussed in previous quarterly reports, most clients chose to adjust their activity level downward with ARAC after initiation of the new fee schedule. It was learned later that a number of firms had to do this because of mismatches with the fiscal policies of the ARAC client firms and the announcement of fee increases for ARAC services. Indications are that the majority of the participating firms are gradually restoring services which were deleted during 1967 and 1968 as the firms make budget

adjustments to allow for purchase of ARAC service packages at the somewhat higher fee schedule.

There seems to be a definite trend that the concept of technology transfer is becoming better understood and more easily recognized when potential client firms are approached for possible participation in the ARAC experiment. It is becoming generally recognized by many firms that in many instances an outside source such as ARAC can do a better, more economical job of supplying new information/technology to a firm in an organized manner than may be done in using the firm's internal sources. Also many firms with sophisticated internal technical information systems are finding that the services from a formal information center such as ARAC can be used in such a manner that they compliment the activities carried on internal to the firm. The ARAC user base continues to expand with client company membership now approaching 90 while revenue from sales of ARAC services is increasing and is projected to reach a level between \$155,000 to \$175,000 for calendar year 1969.

Operations for the period covered by this report may be found on the following pages. The specific areas discussed include activity levels and mix of services, promotional efforts, expansion of the user base, organization and manpower, new products, and residencies conducted for the reporting period.

ACTIVITY LEVELS AND MIX OF SERVICES

Listed on the following pages are various summaries and statistical indicators that delineate activity levels for the various ARAC service elements during the period covered by this report. In examining the table on page four it now appears that the number of retrospective searches received per quarter is once again on the rise after falling to a very low level following adoption of the new ARAC fee schedule in 1967 which placed a unit cost on each retrospective search submitted. The chart on page five shows that in 1965 the quarterly average for retrospective searches reached an all time high of two hundred and twenty. During 1966, 1967, and 1968 as all client firms came under the influence of unit fee basis, the quarterly average for retrospective searches dropped to fifty-four. It appears to be on the upswing again, however, as sixty-one searches were processed during the first quarter of 1969.

An audit of ARAC users conducted in late 1967 and early 1968 indicates that the Retrospective Search Service continues to receive the highest value rating of all ARAC services. The survey also indicated that the primary reason that activity in this service category had declined is that each search submitted to ARAC now requires a separate decision/purchase order or other paper work before the request can be initiated. This seems to suggest that the personnel of ARAC should attempt to devise a fee schedule such that a specific number of searches are included as a package in each annual subscription to ARAC. If a package arrangement for retrospective searches could be reached, it would obviate the necessity for individual purchase orders, etc, with each search request and should serve to stimulate additional requests.

ARAC ACTIVITY SUMMARY

1968 - 1ST QUARTER 1969

	<u>1st Quarter</u> <u>1968</u>	<u>2nd Quarter</u> <u>1968</u>	<u>3rd Quarter</u> <u>1968</u>	<u>4th Quarter</u> <u>1968</u>	<u>Total</u> <u>1968</u>	<u>Quarterly Avg.</u> <u>1968</u>	<u>1st Quar</u> <u>1969</u>
Retrospective Search Service	56	48	38	74	216	54	61
Computer Information Service Programs	15	19	15	16	65	16	20
Selective Dissemination Service Documents	1414	901	790	869	3974	994	826
Other Documents (TSP's, reports of unknown origin, etc.)	1133	442	730	618	2923	731	811
Marketing Information Service Documents	568	554	580	403	2105	526	281
Retrospective Search Service Documents	72	48	9	29	158	40	105
Industrial Applications Service Documents	1504	1045	1216	1363	5128	1282	1489

ARAC DEMAND SERVICES ACTIVITY TRENDS

QUARTERLY AVERAGES

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969*</u>
Retrospective Search Service	44	170	225	242	70	54	61
Selective Dissemination Documents	16	601	650	744	2106	994	826
Industrial Applications Service Documents	179	882	2365	2768	1768	1282	1489
Marketing Information Service Documents	N/A	N/A	230	640	610	526	281
Other Documents (TSP's, Reports of unknown origin, etc.)	25	167	177	319	749	731	811
Retrospective Search Service Documents	10	255	312	340	240	40	105
Computer Information Service Programs	N/A	N/A	29	100	77	16	20
Total Documents (Quarterly Average)	235	1854	3734	4801	5473	3572	3512

*Data in this column is for First Quarter 1969 only.

The ARAC Industrial Applications Service (IAS) continues to be the item available from ARAC which generates the highest number of requests for full reports. This is a weekly service where the ARAC technical staff selects the ten best reports that have been reviewed during the week, writes summaries for these reports, and sends these summaries out on a weekly basis. This service serves to stimulate generation of new ideas among personnel in user firms in that it is multi-disciplinary and as such exposes technical and managerial persons in the firms to new items in peripheral fields of interest. NASA and NASA/AEC Tech Briefs are also included in the weekly mailing of this service.

When the IAS was placed on a fee basis such that each mailing point carried with it an additional charge, the number of mailing points suffered a serious decline as would be expected. Interestingly enough, however, the number of requests for full reports remained at about the same level it had been previously. Simultaneous with the additional charge for each mailing point of the IAS, an individual charge for each document requested was introduced. Yet the number of requests for full reports still continued to grow. The IAS is ARAC's most popular service with small and medium size firms, and methods of repackaging this service in a more palatable form are currently under consideration to further enhance its acceptance.

The list of Standard Interest Profiles (SIPs) available from ARAC has now been expanded to seventy-seven different topics. The table on pages seven and eight lists the titles of each of the SIPs and also lists the number of copies of SIPs which are being sent to client firms by ARAC. The transition from Custom Interest Profiles to Standard Interest Profiles

SERVICES REPORT

<u>SIP Number</u>	<u>Title</u>	<u>Number of Copies</u>
SIP-02	CRYSTAL GROWTH	2
SIP-03	CARBON AND GRAPHITE	2
SIP-04	PHYSICAL METALLURGY	7
SIP-05	POWDER METALLURGY	9
SIP-06	HIGH TEMPERATURE APPLICATIONS OF METALS	8
SIP-07	MATERIALS JOINING TECHNOLOGY	10
SIP-08	MATERIAL FORMING AND MACHINING	13
SIP-09	MICROANALYSIS AND PROPERTIES OF ENGINEERING MATERIALS	10
SIP-10	NON-DESTRUCTIVE TESTING	9
SIP-11	CORROSION AND PROTECTIVE COATINGS	13
SIP-12*	NUCLEAR POWER REACTORS	0
SIP-13	BEARINGS AND LUBRICANTS	12
SIP-14*	AERIAL SURVEY TECHNIQUES	0
SIP-15	FLUID FLOW ANALYSIS	9
SIP-16	FUELS AND COMBUSTION FOR AIR BREATHING ENGINES	5
SIP-17	AIR-WATER POLLUTION AND INDUSTRIAL SAFETY	10
SIP-18	ANALYTICAL CHEMISTRY	10
SIP-19	REINFORCED COMPOSITE MATERIALS	14
SIP-20	POLYMER TECHNOLOGY	15
SIP-21	TEMPERATURE MEASUREMENT	6
SIP-22	VACUUM TECHNOLOGY	4
SIP-24	LASER APPLICATIONS	8
SIP-25	LASER RESEARCH	7
SIP-26	CRYOGENICS AND SUPERCONDUCTORS	2
SIP-27	LOGIC CIRCUITS	9
SIP-28	INFARED INSTRUMENTATION	4
SIP-29	PHOTOGRAPHY	4
SIP-30	DISPLAY SYSTEMS	11
SIP-31	DATA TRANSMISSION	5
SIP-33	RECORDING SYSTEMS	11
SIP-34	SEMICONDUCTOR DEVICES AND MICROCIRCUIT FABRICATION	16
SIP-35	MICROWAVE SYSTEMS	8
SIP-36	RADIO ANTENNAS, TRANSMISSION AND PROPAGATION	6
SIP-37	RADIO COMMUNICATIONS EQUIPMENT	6
SIP-38	RELIABILITY	11
SIP-39	OPERATIONS RESEARCH	12
SIP-40	COMPUTER INFORMATION SERVICE	66
SIP-41	PERSONNEL MANAGEMENT AND BEHAVIORAL SCIENCE	12
SIP-42	ENVIRONMENTAL PHYSIOLOGY	1
SIP-43	BIOMEDICAL TECHNOLOGY	2
SIP-44	RADIOBIOLOGY	1
SIP-45	TURBINE TECHNOLOGY	5
SIP-46*	INFORMATION SCIENCE	1
SIP-47	PROPERTIES OF CERAMIC MATERIALS	5
SIP-49	CONTROL SYSTEMS ANALYSIS	4
SIP-50*	MAGNETOHYDRODYNAMICS	0

SIP-52	SENSORY DEVICES FOR INSTRUMENTATION	9
SIP-56	MANAGEMENT ANNOUNCEMENT SERVICE	26
SIP-60	SPACE-AGE ENERGY SOURCES	3
SIP-63	INDUSTRIAL MATHEMATICS	5
SIP-68	HEAT TRANSFER	8
SIP-70	HOLOGRAPHY	6
SIP-71	HUMAN FACTORS ENGINEERING	4
SIP-73	ADVANCES IN GEOPHYSICS, GEOLOGY AND OCEANOGRAPHY	5
SIP-74	MARKETING INFORMATION SERVICE	62
SIP-75	STRUCTURAL DESIGN	6
SIP-76	PSYCHOPHYSIOLOGY	1
SIP-77	NEUROCHEMISTRY AND BIOCHEMISTRY	3
SIP-115*	PAINTS AND COATINGS	8
SIP-116*	HIGH TEMPERATURE POLYMERS	7
SIP-127*	LOGIC CIRCUITS	9
SIP-134*	SEMICONDUCTOR DEVICES AND MICROCIRCUIT FABRICATION	10
SIP-135*	MICROWAVE SYSTEMS	8
SIP-136*	RADIO ANTENNAS, TRANSMISSION AND PROPAGATION	7
SIP-137*	RADIO COMMUNICATIONS EQUIPMENT	9
SIP-145*	CONTROL SYSTEMS	7
SIP-152*	SENSORY DEVICES	7
SIP-178*	POLYVINYL CHLORIDE	5
SIP-179*	FILM AND ADHESIVES FOR PACKAGING	6
SIP-180*	POLYOLEFINS	5
SIP-182*	ADHESIVES	7
SIP-183*	FOAMED POLYMERS	6
SIP-184*	FIBER REINFORCED PLASTICS	6
SIP-188*	POLYSTYRENE	5
SIP-189*	EPOXY POLYMERS	6
SIP-190*	ELECTRICAL POWER GENERATION	5
SIP-191*	ELECTRICAL POWER TRANSMISSION	6
SIP-193*	ELECTRICAL MACHINERY	5
	TOTAL	657
	INDUSTRIAL APPLICATIONS SERVICE	172
	SELECTIVE DISSEMINATION SERVICE	92

*These SIPs are new and were put on line in early 1969.

seems to be relatively complete at this point with only ninety-two Custom Interest Profiles remaining in the ARAC system. This number is down from a onetime high of over seven hundred Custom Profiles in the ARAC system prior to the introduction of the SIP concept. From an operational point of view, it required approximately thirty-five members on the technical staff to service the seven hundred Custom Interest Profiles which were once in the system. The SIPs are currently served by only eleven ARAC staff members, and as such a larger number of persons are now able to receive a current awareness service at a lower cost.

PROMOTIONAL EFFORT

For the period covered by this report a number of different promotional activities were performed in order to further educate potential users of ARAC services. Pages eleven, twelve, and thirteen of this report list the promotional activities for the reporting period concerned. Present experience still seems to indicate that the most successful method of generating interest among potential users of ARAC services is to cause these persons to visit ARAC in Bloomington and inspect the operation first-hand. This gives potential users a chance to meet the ARAC technical staff with whom they will be working, should they decide to subscribe to any services.

It must be realized, however, that often times it is not practical to expect significant numbers of potential users to visit our location. Given that this cannot be accomplished on a regular basis, the next best approach is to take the ARAC message to these people on a local basis. Accordingly, a number of promotional meetings were held throughout the ARAC area of influence during the period concerned. In particular, briefing sessions were held in St. Louis, Ft. Wayne, Cleveland, Chicago, and Columbus, Ohio. Lists of participants for those persons who attended briefing sessions held either in Bloomington or other cities may be found on pages fourteen through twenty one.

Several different mailing approaches were attempted during this period toward the objective of trying to interest potential users of ARAC services in the technology transfer concept. In general the best mailing lists are those which arise as a result of persons who have attended meetings for the purpose of learning about the new kinds of technology available as a

ARAC PROMOTIONAL ACTIVITIES
FOR
1968 & 1ST QUARTER 1969

January 1968

Conference on Utilization of National Technology
Chicago, Illinois - Panel Participation

C. Mullis
R. Counts

February 1968

Presentation to Salt Institute, Alexandria, Va.

J. DiSalvo
R. Counts

Advisory Committee - State of Ohio Economic
Development-Panel Participation

J. DiSalvo

April 1968

Promotional mailing on Life Science Standard
Interest Profiles to forty-five companies

Jane Page

May 1968

*Promotional Luncheon for St. Louis Area Firms

R. Counts
J. DiSalvo

ARAC Exhibit at AIAA Meeting, St. Louis

R. Counts
ARAC Staff

Promotional Luncheon for Chicago Area Firms

R. Hall

*Promotional Dinner for Cleveland Area Firms

C. Mullis
V. Bradford

June 1968

*National Training Seminars for OSTS Field Engineers
Conference on I.U. Campus

J. DiSalvo
ARAC Staff

July 1968

*Promotional Luncheon - Ft. Wayne Area Firms

J. DiSalvo
ARAC Staff

Barriers to Business Success & Economic Growth
Conference on I.U. Campus

A. M. Weimer

*See succeeding pages for list of participants.

August 1968

U. N. Conference on Peaceful Areas of Space Vienna, Austria - Paper Presented	A. M. Weimer
Promotional mailing of Bibliographies on Urban Problems	R. Hall D. Lundgren
Promotional mailing to Inst. of Printed Circuit Members	R. Hall D. Lundgren

October 1968"

ARAC Exhibit - Dairy & Food Industries Supply Association	R. Counts V. Bradford
Paper presented at A. S. I. S. Meeting Columbus, Ohio	R. Counts
Paper presented at A.S.I.S. Meeting Columbus, Ohio	R. Hall
*ARAC Fall Meeting	J. DiSalvo ARAC Staff

November 1968

Paper presented at Information Retrieval Workshop Madison, Wisconsin	V. Bradford
Fluidics Show & Exposition - ARAC Exhibit	J. Shaffer R. Hall
Cleveland Rubber Institute - Presentation	J. DiSalvo
Presentation to graduating Business MBA students (50)	R. Hall
Promotional mailing to 119 persons as follow-up to Lewis Electrics Power Industry Conference	J. DiSalvo

February 1969

T. U. Officers Meeting - Denver, Colorado - Presentation	J. DiSalvo
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March 1969

Information Industries Association Conference Panel Participation - New York, New York	J. DiSalvo
ARAC Exhibit - Midwest Industrial, Design & Engineering Show - Indianapolis, Indiana (19,500 people visited the show)	J. DiSalvo
Sixth Space Conference - Cocoa Beach, Florida Paper Presented	A. M. Weimer

*See succeeding pages for list of participants.

March 1969 (Continued)

Presentation to Springfield, Illinois High
Twelve Luncheon

D. Goodwin

Promotional mailing to Chicago Area 600 Electrical
Engineering Firms

J. Shaffer
R. Hall

PARTICIPANTS AT ARAC ST. LOUIS LUNCHEON

Mr. Charles B. Graves
Alton Box Board

Mr. Wesley J. Burgess
American Zinc Company

Mr. Manuel Fernandez
Basler Electric Company

Mr. John Stucki
Carter Carburetor

Mr. Ted Hentchel &
Mr. Robert Isringhaus
Cerro Copper & Brass

Mr. Wilson Dowell &
Mr. Fred H. Eckert
Dow Chemical

Mr. Carl Haushalter &
Mr. Randy Gross
Emerson Electric

Mr. R. M. Selly &
Mr. George Tomazi
General Steel Industries

Mr. A. B. Chadwick &
Mr. B. Duchinsky
International Industries

Mr. Joseph Miller
Jackes-Evans Manufacturing Co.

Mr. Bill Olive
Kearney Company

Dr. R. Rands,
Dr. R. H. Spitz &
Mr. John A. Caughlan
Mallinckrodt Chemical

Mr. Don Hill &
Mr. A. G. Hacker
McQuay-Norris Manufacturing Co.

Mr. David F. Winter &
Mr. William C. Reinhardt
Moloney Electric

Mr. John Depp &
Mr. R. E. Lenz
Monsanto Company

Mr. Richard Schuessler
Nooter Corporation

Mr. Robert Winger
Ozark Airlines

Mr. Harry L. Simmons
Scullin Steel

Mr. Mort Estes
Sunnen Products

Mr. Gerald Kiefer &
Mr. Robert Fish
UMC Industries

Mr. E. E. Hartgerink &
Mr. R. E. Stumpe
Union Starch & Refining Company

PARTICIPANTS AT ARAC CLEVELAND DINNER

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The B. F. Goodrich Company
209 South Main Street
Akron, Ohio 44318

Miss Marie Lick
Research Center
The B. F. Goodrich Company
Brecksville, Ohio 44141

ARAC-OSTS-BATTELLE SEMINARS

June 24-28, 1968

PARTICIPANTS LIST

Donald B. Anderson
University of New Mexico - TAC

Mrs. Ruth Atwood
University of Louisville Institute
of Industrial Research

Howard E. Bales
Wright State University

Robert F. Baroch
State of Colorado Division of
Commerce and Development

Royal G. Bivins, Jr.
NASA/TUD

Fred Butner
Battelle Memorial Institute

Dr. Charlesworth
University of Kentucky

Frank Clarke
Georgia Tech

Emmett Conway
Ohio University

Norman E. Cottrell
OSTS - Washington

Edward Dauphinais
University of New Hampshire

John R. Denise, Jr.
Miami University

John DuBois
State of Colorado Division of
Commerce & Development

Carl Elliot, Chairman
OSTS - Washington

Arnold Franke
Southern Illinois University

Mrs. Sudi Freeland
University of Kentucky

Harold Hale
University System of Georgia

Rudy Hampf
University of Colorado

Michael Harris
Indiana University - Grad. Library

William C. Harris
Battelle Memorial Institute

John Hart
North Carolina State University

William Hoff
University of Missouri

Daniel B. Howard
University of Arkansas

Wilbur W. Hurt
Texas College & University System

John Jundt
Ohio State University

John C. Kalbach
Rensselaer Polytechnic Institute

David B. Knoll
State of Illinois Department of
Business and Economic Development

Dennis Knox
Northern Arizona University

Frank J. Kreysa
Smithsonian Institution

Richard Lane
Northern Arizona University

David M. Liston, Jr.
Battelle Memorial Institute

John Little
University of Arizona

Roland A. Loveless
The University of New Hampshire

Arthur Lynch
University of Arizona

John Means
Department of Commerce &
Economic Development

Richard Merriman
Idaho State University

L. L. Merritt
Indiana University

James Robert Michael
Louisiana Polytechnic Institute

Ed Morris
University of Georgia

John Murdock
Battelle Memorial Institute

Peter Nelson
Guam State Technical Services
Agency

Russell Orton
University of New Hampshire

Donald Perry
Southern Illinois University

David Pinkham
University of Vermont

Philip Reily
OSTS - Washington

Deck Reynolds
Small Business Administration

Wayde H. Shafer
Purdue University

J. I. Smith
University of Akron

Ralph Sullivan
OSTS - Washington

J. J. Thompson
Kent State University

Robert Van Fleet
OSTS - Washington

Anthony J. Venett
Pennsylvania State University

Matthew A. Welsh
Former Governor of Indiana
Circle Tower Building

Miss Martha Williams
Illinois Institute of Technical
Research Institute

L. C. Zweifel
The University of Wisconsin

ARAC EXECUTIVE BRIEFING
Ft. Wayne, Indiana
Friday, July 12, 1968

PARTICIPANTS

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Fort Wayne, Indiana

Mr. Richard Felts
Foreman
Indiana Wire Die Company, Inc.
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Mr. John Glasgow
Director-Systems and Procedures
The Heckman Bindery, Inc.
North Manchester, Indiana

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Senior Project Engineer
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Berne, Indiana 46711

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Bonsib, Incorporated
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Fort Wayne, Indiana

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Fort Wayne, Indiana 46803

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Fort Wayne, Indiana

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Square D Company
Huntington, Indiana 46750

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Fort Wayne, Indiana

Mr. Joseph F. Tye
Project Supervisor
Tokheim Corporation
1602 Wabash Avenue
Fort Wayne, Indiana 46801

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Mr. A. A. Wagner
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Value and Industrial Engineering
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Griffin Street
Fort Wayne, Indiana 46803

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General Manager
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Fort Wayne, Indiana 46801

Mr. J. P. Wierzbinski
Chief Engineer
Square D. Company
Flaxmill Road at US 24 Bypass
Huntington, Indiana 46750

Mr. J. D. Zook
Assistant General Manager
American Hoist & Derrick Company
P. O. Box 747
Fort Wayne, Indiana 46801

PARTICIPANTS AT ARAC FALL MEETING

1968

ARAC Users

Darwin Badertscher
Mobil Oil Corporation

J. Bidak
General Electric

W. E. Bosley
Cummins Engine Company

P. F. Carroll
Wheel Horse Products

Celeste E. Garner
Cincinnati Milling Machine Company

John Graham
Ball Brothers Research Corp.

J. C. Habacker
Esterline Angus

John Halgren
International Harvester

R. F. Hawkins
Wheel Horse Products

Thomas E. Hayes
Penn Controls, Incorporated

Wake E. Herriman
ITT Aerospace/Optical

H. Holscher
Owens-Illinois

Norman Keesling
Delco-Remy (Process Engineering)

R. A. Kern
Link Belt

Breene Kerr
Kerr McGee

E. P. King
Eli Lilly

Beverly Knower
Sun Oil Company

E. G. Kruegar
Ball Brothers Research Corp.

John Leighty
Eli Lilly

M. G. Marshall
Pullman, Incorporated

Mr. Pettiford
Crane NAD

Zeke Smith
Potter & Brumfield

Thomas Sowders
Crane NAD

Joan Toeppe
Diamond Shamrock

G. F. Vanderwerp
General Electric

R. L. Venia
Owens-Illinois

ARAC Guest Companies

Ruth Atwood
University of Louisville

Doris Batliner
Chemetron Catalyst

Marvir Britton
Corning Glass Works

Anthony Colavito
Otis Elevator

Madge Davis
American Standard

David Easton
Armco Steel Corporation

Jack Fagan
Amtron, Incorporated

R. B. Foster
Institute of Gas Technology

Roberta Frey
Catalyst & Chemicals

W. J. Gailus
Continental Can Company

Eric Golde
Otis Elevator

E. L. Manderfield
Continental Can Company

George Marshall, Jr.
Continental Oil Company

Alec Peters
Franklin Institute Research Labs.

Donald Royer
McDonnell Douglas

John Smith
Martin Marietta Corporation

John Trisler
Otis Elevator

S. K. Wald
National Lock

M. J. Webster
Uniroyal, Incorporated

Mildred Wilson
DuPont

Shirley Olofson
University of Kentucky

ARAC Guests

Joyce Bohon
Quaker Oats

Joseph Carlson
NASA Technology Utilization Division

John Carrigy
Engineering Index

Joseph G. Gratton
U.S. Atomic Energy Commission

Bart E. Holm
DuPont

Richard L. Leshner
NASA Technology Utilization Division

J. L. McMurtrie
Department of Industry & Commerce
Canada

H. B. Nicholls
Atomic Energy of Canada, Limited

Ronald Philips
NASA Technology Utilization Division

result of government research. For example, all persons who attended the Electric Power Industries Conference at the NASA Lewis Research Center in the Fall of 1968 received a follow-up letter from ARAC. This letter delineated the kinds of things available from ARAC and other government sources and served the purpose of helping to make these people aware of the effort by NASA and other government agencies to transfer technology.

The Washington Kiplinger Letter of September 13, 1968, contained a small write-up on the NASA technology utilization effort. This write-up had brief descriptions of several new items developed as a result of NASA efforts and indicated that further information could be obtained by writing to the Technology Utilization Division of NASA. The Technology Utilization Division of NASA forwarded copies of these letters of inquiries received to ARAC after making an initial response. The promotional staff at ARAC sorted through the letters received for the midwestern portion of the country, and made further contact with these people via mail. Although the results of this particular campaign are not final yet, it certainly seems at this point that the number of potential ARAC users from this list is very significant, and it appears that this effort of following up prospects generated by the Kiplinger letter will be very rewarding.

During 1968 several commercial notices were used by ARAC in selected journals. Results of these efforts are difficult to assess primarily because letters of inquiries received at ARAC seldom indicate the source which initially brought the services of ARAC to the attention of the inquirer. Efforts are underway to assess the impact of this campaign in terms of evaluating it against other promotional efforts on a cost/benefit basis.

The entire process of educating potential users of ARAC services toward the capabilities of the Center and the general concept of technology transfer is becoming easier but still involves large time lags. In general, considerable interest is generated when these concepts are explained. This enthusiasm then needs to carry over sufficiently to cause the interested persons of potential user firms to go back to their superiors and obtain a decision on purchase of ARAC services, cause this item to be entered into the budget, and see to it that the paper-work is carried through to enter into a service arrangement with ARAC. In many cases the enthusiasm, which is significantly high after initial contact by ARAC, wanes as these tasks are performed by the interested person in the prospective user firm. Mechanisms are under investigation by ARAC personnel in an effort to make these tasks easier and maintain enthusiasm for the internal "champion" in the potential client firm while he installs a mechanism for making effective use of ARAC services.

EXPANSION OF THE USER BASE

The table on page twenty-five lists the composite history of new member firms, attrition of member firms, and member firm renewals since ARAC began operations with companies in April, 1963 through the end of the first quarter of 1969. For 1968 a total of sixteen new client firms were added which is down from twenty-two firms added during 1967. Also, ten firms terminated their memberships with ARAC during 1968 which is a higher figure than the three firms which terminated during 1967. Examining these data in retrospect, it is apparent that these changes are manifestations of operating ARAC during calendar year 1968 under severe budget restraints.

The following detailed analyses are offered:

1. As mentioned in the INTRODUCTION of this report, calendar year 1968 was the first year in which ARAC had to operate essentially independently of NASA funding. This was the arrangement as prescribed in the original NASA five-year contract which helped to establish ARAC. Although the Indiana University Foundation made a substantial contribution toward the funding of the Center, it was still necessary to exercise extreme frugality. One of the items in the ARAC budget which had to be substantially reduced was the expenditure of funds for promotional efforts aimed at expansion of the user base. Although sixteen new member firms joined ARAC in 1968, it turns out that the majority of these new members joined as a result of marketing efforts expended during 1967.
2. Another item in the ARAC budget which was reduced substantially during 1968 was the travel portion. Experience indicates that a direct correlation exists between the frequency of visits to client firms by the ARAC technical staff and the percentage renewal of client firms. Obviously, with travel held to an absolute minimum, the percentage of client firms retained decreased somewhat from the previous year.
3. A further cost saving effort at ARAC involves the more liberal use of standardized current awareness services. This is beneficial from an operational point of view in that it requires fewer technical staff members to service a larger number of firms. It is also beneficial from the point of

SUMMARY OF ARAC CLIENT HISTORY

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969*</u>
Client Companies at Beginning of Year	0	29	33	44	48	67	73
New Clients Added	29	7	13	11	22	16	10
Memberships Terminated	0	3	2	7	3	10	1
Member Clients at Year's End	29	33	44	48	67	73	82
Net Gain in Clients	29	4	11	4	19	6	9
Percent of Clients Renewed	N/A	90%	94%	68%	94%	85%	--

*Data in this column is for First Quarter 1969 only.

view of the client firm in that it allows the option of obtaining an extremely low-cost current awareness service. On the negative side, however, standardized services tend to reduce the amount of feedback and personal interaction between the ARAC technical staff and technical staff members in the client firms. This partial loss of communication tends to decrease the percentage of client renewals.

4. On the positive side, however, the ARAC unit fee schedule now makes it quite attractive for firms that require a small ARAC service package to purchase services from the Center on a non-membership basis. The amount of sales in this category is increasing significantly and "pay as you go" users now account for approximately thirty percent of ARAC's activity. None of the user firms in this category are included in the table on page twenty-five.

The ARAC management staff continues to seek new outlets for services available from the Center. In recent months an increasing number of universities have expressed an interest in the services available from the Center. The potential for sales of ARAC services to universities will be aggressively pursued during the coming quarter.

The results of the interest generated as a result of the write-up in the Washington Kiplinger Letter of September 13, 1968 are not final yet. A number of firms approached by ARAC as a result of this activity have expressed a strong interest in the services of ARAC and have decisions pending regarding membership. Past experience indicates that typically six to twelve months are often required before a potential user firm may reach a decision.

One outlet for ARAC services which has been actively pursued in recent years is the various state field service operations established as a result of the State Technical Services Act of 1965. A substantial effort was expended toward this market in June 1968 when ARAC held a series of

training seminars for fifty-two field service agents from the thirteen surrounding states. Many who attended these seminars realized the potential in using ARAC services as a back-up to the various state field service operations. Unfortunately, it appears that this effort may bring few results in view of the uncertainty which now exists in the funding of the OSTS operations for Fiscal Year 1970.

ORGANIZATION AND MANPOWER

ARAC continues to operate as a non-profit arm of the Indiana University Foundation. This arrangement has worked well in that it allows some of the flexibility required for an operation whose budget is likely to experience wide variations on a year to year basis. According to the original plan in 1962, ARAC was to reach a state of development whereby all costs incurred at ARAC as a result of operation with client firms were to be borne by revenue generated via user fees. This objective was accomplished. In order to achieve this, however, the ARAC technical and supporting staff had to be reduced to the bare minimum which would still allow production of the complete line of ARAC services and at the same time maintain technical competence in all the required disciplines.

Thus, the objective of self-sufficiency was attained in that ARAC user firms were supporting (via fees) that portion of the ARAC operation directly concerned with providing service to firms. Unfortunately, user fees did not prove to be a sufficient source of funds to carry on a number of other activities of the Center. These activities include promotional efforts aimed at expanding the user base, funds for account maintenance via visitations as had been done previously, maintenance of the ARAC computerized activity reporting system, development of new products, research and writing on the techniques of technology transfer. In subsequent months, several of these peripheral activities were funded from NASA and other sources on a limited basis.

The basic approach taken at ARAC during this period was to maintain services with existing clients at the most efficient level feasible at

the possible expense of other activities such as promotional efforts, development of new products and other activities listed above. This approach seems to have worked in that eighty-five percent of the ARAC member firms renewed during 1968. The basic idea was to operate with a skeleton staff and maintain rapport with current clients. Expansion of the user base, development of new products, etc., will be actively pursued again if and when funds for these activities become available. In general, the persons responsible for these activities at ARAC have dispersed to various departments on campus such as chemistry, library science, computing centers, etc. These persons have served the Center on a complimentary (non-paid) basis in an advisory capacity. This approach has served to dilute the activities of the Center but has allowed it to operate on revenues generated from user fees in view of the internal cost reductions.

NEW PRODUCTS

The most significant new products developed by ARAC for the period covered by this report concerns the use of both the Electrical/Electronics and Plastics computerized files of Engineering Index, Inc. Through an experimental arrangement, ARAC has gained access to these files and has begun to develop products and offer services based on them. It is expected that retrospective searching, Custom Current Awareness Service, and Standard Interest Profiles will be available based on this file.

To date twenty Standard Interest Profiles based on Engineering Index, Inc., files have been developed. Pages thirty-two through forty-nine of this report consist of an excerpt from the ARAC 1969 Services Catalog. This excerpt delineates the kind of information contained in the Engineering Index files and offers a brief description of each of the twenty SIP's that have been developed to date at ARAC. Initial response already seems to indicate that operating with a somewhat broader data base will serve significantly to enhance ARAC's abilities to transfer aerospace technology to the private sector of the economy.

During the succeeding quarter it is anticipated that ARAC will be printing both the 1967 and the 1968 KWIK Index to the ARAC Industrial Applications Service (IAS). These indexes will be a handy method for gaining access to all of the Industrial Applications Reports announced by this ARAC service for the years involved. The IAS KWIK Index serves two purposes. Firstly, they serve to introduce prospective buyers of the ARAC Industrial Application Service to the kind of reports which they can expect to receive. Secondly, the indexes serve to stimulate orders for full reports remaining in the ARAC inventory of reports announced from the mailing service.

During the coming quarter, it is also expected that ARAC and the RDC network will gain access to the "Condensates File" put together by Chemical Abstracts Service in Columbus, Ohio. Significant interest has been expressed in the Condensates File by both prospective and current client firms of ARAC and access to this data base should serve to significantly enhance the line of information products available from ARAC.

(Excerpted from ARAC 1969 SERVICES CATALOG)

ENGINEERING INDEX LITERATURE FILES

Since the Aerospace Research Applications Center was formed six years ago, most of the technical information services we have provided have been derived from computerized collections of literature assembled by various agencies of the federal government, notably NASA. Now we are beginning services which we have developed from a technical literature collection entirely non-government in origin.

Engineering Index, Inc. regularly collects technical reports and indexes them for retrieval by computer. There are two sections of this collection, a Plastics Section and an Electronics/Electrical Engineering Section. Each month about 500 more articles or reports are announced in the Plastics Section and about 1000 are announced in the Electronics/Electrical Engineering Section.

Engineering Index, Inc. is a non-profit group associated with the IEEE and with other national professional societies through the Engineers Joint Council. They exist for the purpose of promoting the availability and use of engineering report literature to practicing engineers within the United States. They have concluded an agreement with ARAC which permits us to use their materials in order to assist them with their goals.

Users of ARAC services who have an interest in polymers or the electrical/electronics areas are encouraged to consider the services based on the Engineering Index files. The literature covered by these files is more commercially oriented than most reports identified in the federal government abstract journals.

SERVICES OFFERED FROM ENGINEERING INDEX TECHNICAL LITERATURE FILES

Standard Interest Profiles. The ARAC staff has selected several topic areas in both the Plastics and the Electronics/Electrical Engineering Sections which they feel are of prime interest to a number of scientists and engineers in private industry. The following pages outline the topics to be covered. Announcements of reports in abstract form will be mailed on each topic monthly. Each topic is called a Standard Interest Profile, and can be referenced by number. The Standard Interest Profiles served with Engineering Index literature are given reference numbers in the 100's to distinguish them from Standard Interest Profiles served with literature collected by federal agencies.

Custom Interest Profiles. A monthly announcement service can be arranged on topics of special interest to a given client. The subjects to be covered and the cost must be arranged by discussion.

Retrospective Search Service. The Engineering Index files are used by ARAC to assist in problem reviews that are appropriate. The files which ARAC will search depends upon the topic and is a separate decision for each search. Presently ARAC has only the capability of searching Engineering Index files for one year, 1969, but additional capability will be added soon.

1969 STANDARD INTEREST PROFILES FROM ENGINEERING INDEX

The following "100 Series" Standard Interest Profiles are available with abstract announcements being selected from the Electrical/Electronics and Plastics Sections of the Engineering Index File. Announcements are mailed monthly. The profile topics developed from each section is listed below. A description of each of these SIP's follows.

I. Electrical/Electronics Section

SIP-127	Logic Circuits	All of these topics have a corresponding topic from our government source file SIP's.
SIP-134	Semiconductor Devices and Microcircuit Fabrication	
SIP-135	Microwave Systems	
SIP-136	Radio Antennas, Transmission and Propagation	
SIP-137	Radio Communications Equipment	
SIP-149	Control Systems	
SIP-152	Sensory Devices for Instrumentation	
SIP-190	Electrical Power Transmission	These topics are unique to the Engineering Index file.
SIP-191	Electrical Power Generation	
SIP-193	Electric Machinery	

II. Plastics Section

SIP-115	Paints and Coatings	Only SIP-184 has a corresponding topic from our government source file SIP's. All other topics are unique to the Engineering Index file.
SIP-116	High Temperature Polymers	
SIP-178	Polyvinyl Chloride	
SIP-179	Film and Packaging	
SIP-180	Polyolefins	
SIP-182	Adhesives	
SIP-183	Foamed Polymers	
SIP-184	Fiber Reinforced Plastics	
SIP-188	Polystyrene	
SIP-189	Epoxy Plastics	

SIP-115 PAINTS AND COATINGS

Articles cited discuss all aspects of polymer-containing paints and coatings.

- Adhesion to surfaces
- Formulation
- Environmental testing
- Applications -- materials protection

SIP-116 HIGH-TEMPERATURE POLYMERS

The intent of this profile is to announce all reports about work on polymers designed to have service temperatures in excess of 500°F. Most of the articles will deal with polymers which are known to possess this capability.

- Silicon-containing polymers
- Phenyl containing polymers
- Imides
- Nitroso-nitrile rubbers

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-127 LOGIC CIRCUITS

Logic device, as defined in this profile, refers to any device having two stable states and two input terminals, each of which corresponds with one of the two states. Numerous combinations and arrangements of such logic devices are utilized in digital computers and control devices.

Development and Design of Various Types of Logic Devices

- Binary Multipliers
- Gates
- Oscillators
- Adders
- Shift registers
- Memory units
- Fluidic logic circuitry & fluidic amplifiers
- Pneumatic switching circuits
- Trigger circuits
- Timers

Utilization of Microelectronic Components in Computer Hardware

- Large scale integration
- Fabrication of integrated logic circuits

Design of Digital Computers

- Computer organization
- Multiprocessor Computer systems
- Parallel processing computer systems
- Utilization of the computer to design new computer systems
- Redundancy
- Error correction & self repair

Novel Applications of Logic Devices

- Numerical control machines
- Analog-to-digital conversion
- Process control equipment

This profile is designed to service primarily those persons engaged in the development and design of logic devices, primarily electrical but also fluidic and pneumatic devices. In addition, people involved in the design of digital computer systems and in the application of logic devices would derive some benefit from the reports cited in this profile.

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-134 SEMICONDUCTOR DEVICES AND MICROCIRCUIT FABRICATION

Technical information concerning fabrication techniques and reliability analysis applicable to the miniaturization and integration of active circuit elements (diodes, transistors, etc.) and passive components (resistors, capacitors, inductors) receives primary emphasis in this profile.

Research and Development of Microcircuit/Semiconductor Materials

- Silicon Compounds
- Germanium
- Gallium Compounds
- Indium Compounds

Fabrication of Microelectronic Devices

- Doping
- Deposition
- Encapsulation
- Interconnection
- Packaging

Reliability Testing of Microelectronic Devices

- Voltage Breakdown Analysis
- Step Stress Analysis
- Radiation Effects Analysis
- Screening Programs

Partial List of the Types of Microelectronic Devices Included in the Profile

- Transistors
- Diodes
- Rectifiers
- Integrated Circuits
- Microcircuits
- Thin Film Resistors and Capacitors
- Logic Circuits
- Optoelectronic Devices (No Lasers or Masers)
- Monolithic
- Hybrid Circuits
- Organic Semiconductors
- Large Scale Integration
- Field Effect Transistors

This profile is designed to service primarily those persons engaged in the design and fabrication of various microelectronic devices. In addition, those people involved in the research and development of microelectronic devices would benefit from some of the reports cited in this profile. Reports discussing applications of microelectronic devices have been eliminated.

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-135 MICROWAVE SYSTEMS

Technical information concerning microwave communication equipment, components and microwave transmission technology receive primary emphasis in this profile.

Development and Design of Microwave Equipment

- Transmitters
- Receivers
- Transceivers
- Transponders

Development and Design of Microwave Circuit Components

- Gunn Diodes
- Oscillators
- Resonators
- Frequency Multipliers
- Phase Shifters
- Parametric Amplifiers
- Circulators
- Mixers
- Detectors
- Varactor Diodes
- Filters
- Travelling Wave-Tubes
- Klystron Tubes
- Switching Circuits
- Ferrites

Research and Development of Microwave Transmission Technology

- Antennas
- Waveguides
- Transmission Lines
- Noise Measurement and Analysis
- Radar Transmission
- Video Data Transmission
- Digital Data Transmission
- Analog Data Transmission
- Interference and Shielding Analysis

This profile is designed to service primarily those persons engaged in the development and design of microwave devices, especially those devices utilized in communication and radar equipment. In addition, reports concerning important developments in microwave transmission technology are also included as are reports representing novel applications of microwave devices.

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-136 RADIO ANTENNAS, TRANSMISSION AND PROPAGATION

Radio frequency transmission and propagation is emphasized in order to make this profile of maximum benefit to persons concerned with commercial radio communications. Persons with more interest in microwave frequency propagation can receive this in SIP-135, MICROWAVE SYSTEMS.

Antennas

Mechanical Design

- Configuration design
- Reflectors
- Dimensions and dimensional stability
- Selection of materials

Properties

- Signal distortion
- Geometry of Radiation Reflection
- Gain and bandwidth characteristics
- Arrays and phasing

Transmission and propagation

- Field Strength Measurements
- Loss Measurements
- Attenuation and Interference
- Effects of Nature--Weather, Solar Wind, etc.
- Transmission Line Properties and Design

Signal Reception and Processing

- Modulation and Demodulation
- Multiplexing

Information Theory

- Encoding and Decoding
- Error Probabilities
- Signal-to-Noise Ratios

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-137 RADIO COMMUNICATIONS EQUIPMENT

The intent of the profile is to select reports about equipment useful for voice transmission, leaving the transmission of data to the DATA TRANSMISSION profile, SIP-131. Most of the reports are concerned with components rather than communication systems.

Circuits frequently mentioned:

- Mixers
- Amplifiers
- Oscillators
- Filters
- Detectors
- Pulse Charts
- Frequency converters
- Frequency multipliers

Components frequently mentioned:

- Capacitors
- Resistors
- Transistors
- Diodes
- Connectors

Additional Topics:

- Reliability of equipment
- Protection of equipment
- Packaging

Topics excluded:

- Microwave and radar equipment
- Aero-navigation equipment
- Antennas and propagation

Equipment frequently mentioned:

- Transmitters
- Receivers
- Transceivers
- Transponders
- Modulators, demodulators

The profile is intended to be of interest to the communications industry, particularly businesses involved in design and production of radio equipment.

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-149 CONTROL SYSTEMS ANALYSIS

This profile identifies reports dealing with the theory and design of control systems. Although coverage is heavily oriented toward mathematical analysis techniques, information on control hardware is included when applicable to the design of whole systems.

Control Theory

- Adaptive control**
- Stochastic control analysis**
- Stability analysis**

Control System Design

- Optimizing systems**
- Reliability analysis**
- Properties of control hardware**

SIP-149 is related to SIP-27 and SIP-127, LOGIC CIRCUITS. The difference between the two is that this profile does not emphasize the circuitry, but rather the analysis and design of a complete system.

Cost: \$80/year

Lit. Sources: Engineering Index File

SIP-152 SENSORY DEVICES FOR INSTRUMENTATION

Sensing devices, as defined in this profile, denotes any device designed to detect, observe or measure a physical property or quantity. Research and development of sensing devices seeks to attain higher accuracies, greater sensitivities, greater capability for measuring extreme values, applicability under more extreme conditions of use, or capability of capturing effects occurring at higher speeds than the state-of-the-art has permitted previously. The emphasis is on the detection of phenomena.

Development and Design of Measuring Devices or Techniques

Type of Devices

- Recording Device
- Transducers
- Force balance accelerometers
- Rate Gyroscopes
- Thermocouples
- Manometers
- Flowmeters
- Anemometers
- A/D and D/A devices for all of the above

Types of Physical Properties or Quantities being Measured

- Noise
- Vibration
- Pressure
- Shock
- Strain
- Displacement
- Acceleration
- Velocity
- Force
- Liquid levels
- Shaft rotation rates
- Optical parameters
- Electrical parameters
- Physical dimensions
- Gas concentrations
- Density
- Flow rates

Calibration Techniques for Sensory and Measuring Devices

Applications for these Devices

This profile is designed to primarily service persons engaged in the design and development of sensing devices and techniques. In addition, persons involved in plant instrumentation work who design their own equipment for special application may benefit from the profile.

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-178 POLYVINYL CHLORIDE

All aspects of the manufacture and applications of PVC form subjects of reports cited in this profile.

- Polymerization, monomers and copolymers
- Additives used in PVC
- Plasticizers used in PVC
- Blends with other polymers
- Physical & Chemical properties testing
- Market and applications reports

SIP-179 FILM AND ADHESIVES FOR PACKAGING

Selection of articles is done with both the packaging materials manufacturer and the packaging materials user in mind. Molded application, such as for bottles, are not included. Likewise articles on polymer films for applications not related to packaging, for example, osmosis membranes, are not included.

- Polymers for films
- Film extrusion
- Film testing
- Film application
- Hot-melt adhesives
- Cushioning materials
- Package applications
- Package testing

Cost: \$80/year

Lit. Sources: Engineering Index File

SIP-180 POLYOLEFINS

All articles which have primary reference to polyethylene or polypropylene are cited. The only exception are articles where a polyolefin is used as a comparative resin for describing other polymers.

- Copolymers: Ethylene or propylene with other monomers
- Polymerization processes
- Rheology
- Testing and Analysis
- Additives
- Properties
- Applications

SIP-182 ADHESIVES

Both packaging and structural adhesives are discussed in the articles cited. The difference between articles cited by this profile and those cited by SIP-179 is that SIP-179 emphasizes only packaging applications of adhesives while the articles cited here deal with all aspects of polymeric adhesives.

- Theory and mechanism of adhesion
- New types of adhesives
- Properties of adhesives
- Bond testing
- Sealing compounds
- Applications

Articles on coatings are included only if coating adhesion is specifically mentioned. Articles discussing binders for reinforced materials are also avoided unless there is emphasis on the mechanism of adhesion to filler particles.

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-183 FOAMED POLYMERS

The articles selected discuss all aspects of all types of foamed plastics, testing, properties, foam production and applications.

SIP-184 FIBER REINFORCED PLASTICS

Reports announced discuss the reinforcement of plastics by all kinds of filler materials.

- New types of reinforced materials
- Compounding
- Chemical and mechanical properties of reinforcing materials
- Properties of matrix materials, chemical and adhesive properties primarily
- Mechanisms of reinforcement
- Applications

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-188 POLYSTYRENE

This profile announces all reports dealing with styrene polymers. Many of the reports deal with new styrene copolymers. Articles are not cited which deal with the most common styrene copolymer, butadiene-styrene.

Polymerization and graft polymerization
Compounding and forming
Properties and testing
Applications

SIP-189 EPOXY POLYMERS

Reports are selected because of reference to bisphenyl containing polymers. Many of the reports will discuss polymerization processes.

Chemical and physical properties and testing
Compounding
Applications -- mostly coatings or reinforced plastics

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-190 - ELECTRICAL POWER GENERATION

This profile is a survey of the open literature, both domestic and foreign, in the electrical power generation field.

Power Plants

**Steam
Hydroelectric
Gas Turbine
Diesel Electric Nuclear**

Equipment

**Turbogenerators
Hydraulic Turbines
Boilers
Condensors
Generators
Steam Turbines
Generator - Regulator**

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-191 - ELECTRICAL POWER TRANSMISSION

This profile is a survey of the open literature, both foreign and domestic in the electrical power transmission field.

Control

**Automatic Load Scheduling
Remote Control Centers
Computerized Methods**

Protection

**Lightning Short Circuits
Sampling Techniques
Circuit Breakers, Relays, Semiconductor Devices**

Stability

**Radial Power Links
Oscillations - Electrical & Electromechanical**

Transmission Lines

Physical & Electrical Properties

Electric Switchboards

**Design, Overvoltage protection
Protection Against Arcing Faults**

Cost: \$80/year

Lit. Source: Engineering Index File

SIP-193 - ELECTRIC MACHINERY

This profile is a survey of the open literature, both domestic and foreign, in the electrical machinery area. It covers the design, construction, testing, analysis, etc. of all the pieces of equipment mentioned below.

Electric Motors

- Induction
- Synchronous
- Squirrel Cage
- Traction
- Fractional Horsepower
- Direct Current
- Three-Phase Shunt Commutator

Electric Generators

- Direct Current
- Insulation Problems, Cooling
- Synchronous
- Mechanical Losses
- Impulse Voltages

Electric Motor Generators

Electrical Machinery

- A Synchronized Synchronous Machine
- Variable Speed Electric Drive
- Feedback Systems

Cost: \$80/year

Lit. Source: Engineering Index File

RESIDENCIES

The ARAC operation continues to attract a significant number of visitors who are interested in inspecting the operation first-hand. These visitors come from a variety of organizations, both domestic and foreign. Pages fifty-one and fifty-two list the visitors to ARAC for the period covered by this report. Not included in this list are visitors from ARAC member and prospective member companies. Many of the visitors are interested in obtaining a detailed picture of the operation. These persons, on occasion, qualify for the ARAC Residency Program. Pages fifty-three through sixty-one list the persons who participated in the ARAC Residency Program for the period covered by this report.

VISITORS TO ARAC

First Quarter 1968

<u>DATE</u>	<u>COMPANY</u>	<u>VISITOR</u>
1/8-9/68	Office of State Technical Services, Georgia	John Kunze
2/6/68	Lewis Research Center, NASA, Cleveland, Ohio	Dr. Olson Mr. I. Pinkel Mr. G. Mandel
2/6/68	University of Kentucky, Lexington, Kentucky	Miss Sandra Spahn Mrs. Shirley Olofson Mr. William Lee
2/12/68	Georgia State Technical Services Office, Atlanta, Georgia	Mr. Lee Quarterman
3/11/68	Office of State Technical Services, Washington, D.C.	Mr. Norman Cottrell
3/27-28/68	Representing Technology Utilization effort in Germany	Helmut Guenther Kolodziej

Second Quarter 1968

4/30/68	Materials Engineering Magazine, Chicago, Illinois	Mr. T. Knorr
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Third Quarter 1968

7/1/68	Georgia STS, Atlanta, Georgia	Mr. Fred Madeo
7/22/68	George Washington University Washington, D. C.	Mrs. Margaret Moss
7/30/68	Israel Ministry of Defense Israel	Mr. Y. Lahat
9/9/68	Atomic Energy Commission Technical Information Center	Edward Brunenkant
9/11/68	American Banking Association Trenton, Missouri	Willis Alexander

Fourth Quarter 1968

10/1/68	A. F. Machineability Data Center, Cincinnati, Ohio	Robert E. Snider
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VISITORS TO ARAC

Fourth Quarter 1968 (Cont'd.)

10/1/68	NAD Crane Safety Crane, Indiana	Jerry Marsischky
11/15/68	CNES	Maurice Claverie
11/15/68	American Banking Association	Mr. Detrick Mr. Mitchel Mr. Willis
12/6/68	University of Akron	Mr. Panos Kokoropoulos

First Quarter 1969

2/4/69	Marshall S.F.C. Huntsville, Alabama	John Graham
3/4/69	Battelle Memorial Inst. Columbus, Ohio	Donald H. Owens
3/13/69	Franklin College Franklin, Indiana	Montell Ogden

AEROSPACE RESEARCH APPLICATIONS CENTER

RESIDENCY REPORT

Date March 27 - April 1, 1968

Name and Address	Trainee's Objective
Helmut Gunther Kolodziej Bad Gotesberg, Ger. Gesellschaft fur Weltraumforschung	To study information dissemination and technology transfer efforts in the U.S.A.

INSTRUCTION PROGRAM

Instructor	Time Spent	Subjects Covered and Comments
R. W. Counts	32 hours	1. The history of T.U. in the U.S. (NASA efforts).
J. DiSalvo	6 hours	2. Organizational structure of T.U. operations.
R. Hall	4 hours	3. Economics of the T.U. operation
C. Mullis	6 hours	4. Goals and successes of the T.U. operation.
V. Bradford	5 hours	5. Directions of development for T.U. at the present time.
A. Weimer	3 hours	

AEROSPACE RESEARCH APPLICATIONS CENTER

RESIDENCY REPORT

Date April 4, 1968

Name and Address	Trainee's Objective
Mr. Noel Isoto Mr. Fiorini ESRO	They are operating a TU effort for ESRO. They wanted to observe & "brain pick" ARAC operations.

INSTRUCTION PROGRAM

Instructor	Time Spent	Subjects Covered and Comments
DeSilvo, Counts Mullis, Hall	1½ hour	Established objective and outlined plan of consultations for the day.
Counts	2½ hours	Spent time with Fiorini discussing ARAC's computer systems & their utilization.
Mullis, Bradford	2½ hours	Spent time briefing Isoto on ARAC operations in Q-14 and relations with member companies.
Counts, Mullis 3 engineers	1½ hour	Lunch, exit interview.

AEROSPACE RESEARCH APPLICATIONS CENTER

RESIDENCY REPORT

Date April 5, 1968

Name and Address	Trainee's Objective
G. Ashton Byroade Rock Island Arsenal Rock Island, Illinois	Mr. Byroade was an information specialist with the Defense Department. He was interested in information center operation for Defense Department purposes.

INSTRUCTION PROGRAM

Instructor	Time Spent	Subjects Covered and Comments
R. W. Counts C. W. Mullis	8:30 am to 5:30 pm	The services of ARAC were discussed in light of available information and needs of industry. The techniques and products developed by ARAC were analyzed for possible application to the needs of Rock Island Arsenal.

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RESIDENCY REPORT

Date May 2, 1968

Name and Address	Trainee's Objective
Bernard Wetzel French Planning Agency	To observe the final User/RDC interface in operation.

INSTRUCTION PROGRAM

Instructor	Time Spent	Subjects Covered and Comments
Weimer, Mullis	2 hours	Preliminary discussion to plan a consultation itinerary.
Bradford, Mullis 4 engineers	2 hours	Detailed discussion of the user interface. ARAC was fortunate enough to have Mr. Delbert Wofford present for renewal of the Texas Gas Transmission Company membership during this discussion.
Weimer	4 hours	Detailed discussion of the relationship between Technology Utilization and Economic Growth & exit interview.

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RESIDENCY REPORT

Date July 22, 1968

Name and Address	Trainee's Objective
Margaret Moss George Washington Univ. Washington, D. C.	To investigate the technology of information handling.

INSTRUCTION PROGRAM

Instructor	Time Spent	Subjects Covered and Comments
J. DiSalvo	4 hours	1. Brief history of T. U. efforts.
R. Hall	4 hours	2. NASA STID/STIF information handling efforts.
R. W. Counts	4 hours	3. ARAC procedures and policies in this area.

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RESIDENCY REPORT

Date July 30, 1968

Name and Address	Trainee's Objective
Jacob Lahat Israeli Defense Ministry Israeli Embassy Washington, D. C.	Survey the state-of-the-art in advanced information services available to the public.

INSTRUCTION PROGRAM

Instructor	Time Spent	Subjects Covered and Comments
R. W. Counts R. W. Hall V. E. Bradford J. DiSalvo	6 hours 1 hour 2 hours 1 hour	1. Thesaurus Structure and Control 2. ARAC operating philosophy 3. Information Retrieval Techniques 4. State-of-the-art in information services in general 5. A detailed review of the ARAC operation 6. Personnel requirements for information centers.

AEROSPACE RESEARCH APPLICATIONS CENTER

RESIDENCY REPORT

Date September 11, 1968

Name and Address	Trainee's Objective
Willis Alexander President American Banking Asso.	The potential use of ARAC services by industrial customers of Banks and by Banks in loan agreements.

INSTRUCTION PROGRAM

Instructor	Time Spent	Subjects Covered and Comments
A. M. Weimer	8 hours	1. What ARAC can do specifically
R. Hall	4 hours	2. How a bank's loan department might make use of ARAC services
J. DiSalvo	2 hours	3. Experimental working agreements which might be established
R. W. Counts	2 hours	

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RESIDENCY REPORT

Date October 1, 1968

Name and Address	Trainee's Objective
Robert E. Snider A. F. Machineability Data Center, Ohio	ARAC informatio, handling technology.

INSTRUCTION PROGRAM

Instructor	Time Spent	Subjects Covered and Comments
R. Hall	6 hours	1. ARAC's philosophy ^{for} to large data file handling.
J. DiSalvo	2 hours	2. ARAC experience over the past 5 years.
R. Counts	2 hours	3. How ARAC philosophies might be applied to A.F.M.D.C. data handling problems.
V. Bradford	2 hours	

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RESIDENCY REPORT

Date November 15, 1968

Name and Address	Trainee's Objective
Maurice Claverie C.N.E.S. Bretigny S/ORGE	To catch up with state-of-the-art in technology transfer.

INSTRUCTION PROGRAM

Instructor	Time Spent	Subjects Covered and Comments
R. W. Counts	7 hours	The History of Technology Transfer in the United States.
J. DiSalvo	3 hours	The organizational structure and goals necessary to successfully transfer technology. The techniques which have been developed and are presently used by ARAC.
V. E. Bradford	3 hours	Dissemination of ARAC operations.