REPORT

PROJECT FOR THE ANALYSIS OF TECHNOLOGY TRANSFER

Quarterly Evaluation Report #5

1 January 1969 - 31 March 1969

Contract NSR 06-004-063

DENVER RESEARCH INSTITUTE
UNIVERSITY OF DENVER

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- Prepared for -

National Aeronautics and Space Administration

- Prepared by -

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INTRODUCTION

This is the fifth report in a series prepared for the Office of Technology Utilization of the National Aeronautics and Space Administration (NASA). It focuses on recently gathered data related to secondary uses of technology originally developed by NASA and the Atomic Energy Commission (AEC).

The data presented were gathered as part of the Project for the Analysis of Technology Transfer (PATT), operated under NASA sponsorship by the University of Denver's Research Institute. PATT was established in November 1967, to provide a better understanding of the technology transfer process by examining information on the nonspace applications made of NASA and AEC developed technology. To achieve this general objective, PATT has six more specific objectives:

1. To collect data on actual and potential cases of transfer resulting from NASA's Tech Brief - Technical Support Package program;

2. To operate a technology transfer data bank;

3. To analyze and evaluate information collected;

4. To document specific cases of technology transfer;

5. To perform a series of related research tasks;

6. To report research findings.

This report summarizes progress made to date on achieving these goals. Section I presents an overview of PATT research activities during the first three months of 1969. Information incorporated into the data bank during the calendar year 1968 is reported in Section II. In Section III, a preliminary attempt is made to integrate most of the information placed in the data bank since November 1967. Five specific examples of the transfer of NASA generated technology are reported in Section IV. Finally, Section V summarizes one recently completed special research task.

SECTION I. PATT FIRST QUARTER 1969 RESEARCH ACTIVITIES

A synopsis follows of significant activities occurring during the first three months of 1969 in the Project for the Analysis of Technology Transfer.*

Transfer Data Bank Operations

Information in the PATT Transfer Data Bank was gathered from two sources: from letters sent to NASA and AEC requesting specific technical information, and from follow-up questionnaires mailed to requestors of Technical Support Packages (TSP's).

During the first three months of 1969, PATT received approximately 4,500 letters sent to NASA or AEC by persons requesting various TSP's. By reviewing these TSP request letters, DRI determined the dates requests were made; the sizes, locations, and Standard Industrial Classifications (SIC's) of organizations whose members requested TSP's; and the TSP subject areas of interest to requestors. All together, information from a total of 24,041 TSP request letters had been keypunched and entered into the Transfer Data Bank by March 31, 1969.

Additional information about TSP requestors was gathered through the use of questionnaires. During the first quarter of 1969, PATT mailed 482 questionnaires to TSP requestors, bringing the total to 12,200. By March 31, 1969, 6,662 TSP questionnaires (54.6 percent) had been completed, returned to DRI, and entered into the Transfer Data Bank. These data were useful in determining how requestors learned about the availability of specific TSP's; the various ways TSP information was applied; and requestors' ratings of TSP usefulness. Sections II and III of this quarterly report summarize much of the information contained in the Transfer Data Bank.

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* Certain aspects of the activities summarized in this section have been discussed in PATT monthly reports submitted to NASA Headquarters during the three month period, January to April 1969.

Change in Sampling Procedure for TSP Questionnaire Follow-Up

Normal TSP questionnaire follow-up lag time remained at six months during the first quarter of 1969. Commencing on October 1968 (with May 1968 TSP requests) questionnaires were sent to a 20 percent sample of requestors, in contrast to the 100 percent follow-up used previously. This procedure was followed on requests from May 1968 through October 1968. At that time, in response to the results of an analysis of the returned questionnaires and of the samples drawn, the sample rate was raised to 50 percent of the total TSP request letters received. The new sampling procedure will take effect with the November 1968 requests. Also, an additional 30 percent sample will be selected for questionnaire follow-up from those months which have received only a 20 percent sample (May 1968 through October 1968). It is anticipated that this activity will commence in June 1969 and will be completed in mid-August 1969. Questionnaires mailed out under this additional 30 percent sample will have lag times in excess of the standard six months (in some cases up to one year); however, this is regarded as an opportunity to examine again the effect of varying lag times on response rate and quality of responses to the questionnaire.

More Intensive Analysis of Data Bank Information

Initial steps were taken in February and March to analyze and interrelate information in the Transfer Data Bank. Two-way and three-way cross tabulations of different factors were made to understand better how the specific bits and pieces of the data fit together. For example, an attempt was made to relate the size of a requestor's organization to how the individual learned of the availability of the TSP. The initial results of these cross tabulations are presented in Section III.

TSP Questionnaire Revision

An attempt was made during this quarter to expand and strengthen the questionnaire being sent to TSP requestors. The revised questionnaire, which is in the process of being field tested, will be used to provide additional information about TSP requestors. A draft copy of the revised questionnaire is presented in Appendix A.

Special Research Tasks Undertaken or Completed

A special analysis of four Technical Support Packages was undertaken during the first quarter of 1969. Questionnaire and telephone follow-ups began on a relatively large number of requests for the four selected TSP's. The purpose of this effort is to develop insights into the reasons why the selected TSP's were popular and how they were used. Planned completion date for this special task is June 30, 1969.

A special study was undertaken to evaluate the NASA effort to distribute Gemini and Apollo photographs. Requests for such photographs have been serviced by the Technology Application Center at the University of New Mexico. Approximately 400 photograph requestors will be contacted and the resulting data will be analyzed. This task is scheduled for completion by June 30, 1969.

Two other special research tasks were largely completed during the first quarter of 1969. The first involved a customer evaluation of the technology transfer services offered by a NASA Regional Dissemination Center. The second was aimed at evaluating the NASA Biomedical Application Team program. The results of these Regional Dissemination Center study are summarized in Section V.

Technology Utilization Officers Conference

DRI co-hosted with NASA a Technology Utilization Officers Conference held at the University of Denver on February 18, 19 and 20.

Papers Presented at Sixth Space Congress

Two papers were presented by PATT personnel at the Sixth Space Congress in Cocoa Beach, Florida, during the week of March 17, 1969. Theodore D. Browne, former PATT Project Supervisor, discussed the secondary uses of aerospace biomedical technology. J. Gordon Milliken reviewed the contributions of space technology to management science. Copies of both presentations have been submitted to NASA Headquarters under separate cover.

Technolology Transfer Seminar Rescheduled

A decision was made late in the first quarter of 1969 to reschedule a seminar on the future of technology transfer. The

seminar, "Environment and the Action in Technology Transfer: 1970-1980," was planned originally for Aspen, Colorado, on May 28 to 31. It has been rescheduled for September 25 to 28 at Snowmass-at-Aspen because of conflicting commitments of key participants.

Staff Participants in PATT

DRI staff participants in PATT during the past three months, and the primary activities of each individual, were as follows:

DRI Staff Member	Primary Activities
Dean C. Coddington, Research Economist	Project supervision, RDC customer evaluation
T. D. Browne, Research Economist	Project supervision (through January 15, 1969), administrative support and research design
R. O. Morgan, Research Economist	Analysis of data bank, telephone follow-ups
James E. Freeman, Communication Researcher	Development of revised questionnaire, analysis of data bank, arrangements for TUO conference, Biomedical Application Team study
M. Terry Sovel, Research Economist	RDC customer evaluation, PATT library
Ronald J. Hensen, Research Engineer	In-depth survey of TSP requestors, Gemini and Apollo photograph evaluation
Robert W. Joselyn, Research Economist	Gemini and Apollo photograph evaluation
Carl von E. Bickert, Research Psychologist	Biomedical Application Team study
Barbara Stevenson, Administrative Assistant	Operation of data bank

SECTION II. 1968 REQUESTS FOR TECHNICAL SUPPORT PACKAGES

During 1968, the National Aeronautics and Space Administration (NASA) received 17,367 requests for Technical Support Packages (TSP's).* A breakdown by NASA centers originating the TSP's is given below:

NASA Centers	Number of TSP Requests in 1968**	Percent
Marshall Space Flight Center	6,441	37.1
Lewis Research Center	2,458	14.2
Manned Spacecraft Center	1,818	10.5
Goddard Space Flight Center	1,510	8.7
Space Nuclear Propulsion Office	1,407	8.1
Ames Research Center	1,321	7.6
Jet Propulsion Laboratory	749	4.3
Argonne National Laboratory***	588	3.4
Kennedy Space Center	498	2.9
Langley Research Center	375	2.2
NASA Headquarters	78	0.4
Flight Research Center	59	0.3
Electronics Research Center	52	0.3
Other	13	0.0
TOTALS	17,367	100.0

* Data presented in this section are derived only from TSP request letters received by NASA and AEC Centers during calendar year 1968. This contrasts with data analyzed in Section III which are based on TSP request letters dated from June 1966 through mid-October 1968.

** These requests do not include those made to Regional Dissemination Centers.

*** Argonne National Laboratory is sponsored by the Atomic Energy Commission.

When the 1968 request frequency for each center was analyzed on a month-to-month basis, certain major fluctuations in request frequency were noted (see Appendix B, Table B-1). For example, the number of TSP requests for Marshall Space Flight Center ranged from a low of 311 in February 1968 to a high of 693 in December 1968, with a general tendency for request frequency to increase as the months passed. A similar spread or range in request frequency was noted for Lewis Research Center, but with a reverse order: from a high of 435 requests in April 1968 to 91 requests in June 1968.

Locations of 1968 Requestor Organizations

The regional distribution of TSP requests during 1968 is shown in the following table:*

Geographical Region of TSP Requestor Organization	1968 Request Frequency	Percent
Northeast	5,926	34.1
North Central	4,538	26.1
West	3,638	21.0
South	2,907	16.7
Non-Continental USA	26	0.2
Foreign	332	1.9
TOTALS	17,367	100.0

* The states in which TSP requestor organizations were located were grouped as follows: NORTHEAST (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont); NORTH CENTRAL (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin); WEST (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming); SOUTH (Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia, District of Columbia); NON-CONTINENTAL USA (Alaska, Hawaii, Puerto Rico); FOREIGN (Australia, Belgium, Canada, France, Great Britain, Italy, Japan, Sweden, West Germany, Africa-Asia, Latin America, Other Europe).

Requestors in seven states, having in excess of 800 TSP requests each during 1968, accounted for 57.3 percent of the 1968 requests for Technical Support Packages (see Appendix B, Table B-2):

Location of Requestor Organization	1968 Request Frequency	Percent
California	2,642	15.2
New York	1,988	11.4
Pennsylvania	1,423	8.2
Ohio	1,305	7.5
Illinois	885	5.1
New Jersey	860	5.0
Massachusetts	857	4.9
All Other States	7,407	42.7
TOTALS	17,367	100.0

Of the top seven states, California and New York accounted for about one-fourth (26.6 percent) of all 1968 TSP requests.*

Standard Industrial Classifications (SIC's) of 1968 Requestor Organizations

Three SIC Groups of TSP requestor organizations accounted for three-fourths (75.9 percent) of all TSP requests during 1968. They included manufacturing companies (52.3 percent), service organizations (14.6 percent), and government agencies (8.5 percent). The first table on the next page presents 1968 request frequency by the SIC of requestor organizations.

* The percentage pattern of TSP requests per state and region is in substantial agreement with those presented in PATT - The Initial Year, University of Denver, 1968, p. 19.

Organizational SIC's*	1968 Request Frequency	Percent
Manufacturing	9,092	52.3
Services (Including Educational)	2,538	14.6
Government	1,484	8.5
Individuals	788	4.5
Wholesale and Retail Trade	242	1.4
Mining	215	1.2
Transportation, Communication, and Utilities	144	0.8
Finance, Insurance, and Real Estate	100	0.6
Contract Construction	42	0.3
Agriculture, Forestry and Fisheries	3	0.0
Undetermined	2,719	15.7
TOTALS	17,367	99.9

Among manufacturing companies, requestors in electrical and nonelectrical machinery companies ordered almost one-half (47.6 percent) of the TSP's for their group:

U.S. Manufacturing Industries	1968 Request Frequency	Percent
Electrical Machinery	2,886	31.7
Nonelectrical Machinery	1,444	15.9
Transportation Equipment	1,220	13.4
Professional, Scientific, and Controlling Instruments	982	10.8
All Others	2,560	28.2
TOTALS	9,092	100.0

Requestors in educational and business service organizations generated 76.3 percent of the 1968 TSP requests among all service organizations:

* Industries are grouped in accordance with Bureau of the Budget, Standard Industrial Classification Manual 1967, U.S. Government Printing Office, pp. V-VII. A complete listing of 1968 TSP requests for each two-digit SIC is contained in Appendix B, Table B-3.

U.S. Service Organizations	1968 Request Frequency	Percent
Educational	1,347	54.1
Business	563	22.2
Medical and Other Health Services	178	7.0
All Other Service Organizations	450	16.7
TOTALS	2,538	100.0

Finally, employees of the Federal Government ordered almost all (95.1 percent) of the TSP's requested by governmental sources during 1968:

Government Organizations	1968 Request Frequency	Percent
Federal Government Agencies	1,412	95.1
State Government Agencies	53	3.6
Local Government Agencies	14	0.9
International Government Agencies	5	0.4
TOTALS	1,484	100.0

Size of 1968 TSP Requestor Organizations

The following table shows the percentages of 1968 TSP requests according to the sizes of the organizations with which requestors were associated:

Organizational Size (Employees)	1968 Request Frequency	Percent
10,000 or more	5,369	30.9
5,000 to 10,000	1,043	6.0
1,000 to 5,000	1,407	8.1
500 to 1,000	617	3.5
100 to 500	939	5.4
50 to 100	284	1.6
10 to 50	416	2.4
1 to 10	1,179	6.8
Undetermined	6,113	35.3
TOTALS	17,367	100.0

The data show that requestors in large organizations accounted for almost one-third (30.9 percent) of all 1968 TSP requests. The remaining 69 percent of the 1968 TSP requests were about evenly distributed among organizations of all other size ranges. It should be noted that the category "undetermined" contains cases which could inflate both very large organizations (10,000 employees or more) and very small organizations (one to ten employees). It was not possible, based on available data, to categorize the sizes of a large number of organizations requesting TSP's. The revised questionnaire will help reduce the proportion of requestors in the undetermined category.

1968 TSP Subject Area Request Frequency

The number of requests for each of the six categories of Technical Support Packages is shown below:

TSP Subject Area	1968 Request Frequency	Percent
Electrical (Electronic)	6,637	38.2
Mechanical	4,670	26.9
Materials (Chemistry)	4,010	23.1
Physical Sciences (Energy Sources)	1,302	7.5
Computer Programs	497	2.9
Life Sciences	251	1.4
TOTALS	17,367	100.0

There was a strong tendency for 1968 requestors to order TSP's in the electrical, mechanical, and materials subject areas. Altogether 1968 requests for TSP's in these categories accounted for 88.2 percent of total requests. This can be partially accounted for by the fact that requestors in manufacturing and service types of organizations with special interests in these subject areas, generated two-thirds (66.9 percent) of all 1968 TSP requests.

On the other hand, because TSP's in the physical sciences, computer programs, and life sciences areas were ordered with less frequency should not be interpreted to mean there is no demand for technology in these areas. Further research should be carried out to determine (1) whether differences exist in publicizing the availability of TSP's in these subject areas, (2) the reasons why people who need or could use such information fail to learn of its availability or decide not to order it.

TSP's Most Often Requested in 1968

1968 requestors ordered TSP's associated with a total of 1,206 different NASA or AEC Tech Briefs. In most instances, the number of TSP requests per Tech Brief was quite small (i.e., one or two requests). A relatively small number of Tech Briefs, however, generated a disproportionately large number of requests. Listed below are the 12 Tech Briefs associated with TSP's which accounted for 23.1 percent of all 1968 requests:

Tech Brief Number	Title	1968 Request Frequency	Percent of All 1968 Requests
67-10200	Workmanship Standards for Fusion Welding	1,199	6.9
68-10069	Principles of Optical-Data Processing Techniques	495	2.8
67-10197	New Class of Thermosetting Plastics Has Improved Strength, Thermal and Chemical Stability	443	2.5
67-10440	Fluid Properties Handbook	387	2.2
67-10340	High-Strength Tungsten Alloy with Improved Ductibility	244	1.4
68-10095	Cobalt-Tungsten, Ferromagnetic High-Temperature Alloy	243	1.4
67-10482	Surface-Crack Detection by Microwave Methods	215	1.2
68-10397	Charts Designate Probable Future Oceanographic Research Fields	189	1.1
67-10610	Handbook of Cryogenic Data in Graphic Form	176	1.0
68-10136	The X Square Statistic and Goodness of Fit Test	157	0.9
67-10119	Personal Communication System Combines High Performance with Miniaturization	152	0.9
68-10065	Multichannel Implantable Telemetry System	143	0.8
All others		13,324	76.9
TOTALS		17,367	100.0

Summary

Several factors emerge from this overview of PATT Transfer Data Bank information on 1968 requests for NASA and AEC Technical Support Packages (TSP's): 1968 TSP requestors tended to order TSP's developed at either the Marshall Space Flight Center or the Lewis Research Center; there were several pronounced changes in the number of TSP requests per month at many NASA and participating AEC centers; well over one-half (60.1 percent) of the TSP requestors worked with organizations located in the Northeast and North Central regions of the United States; the states of California and New York accounted for approximately one-fourth (26.6 percent) of the 1968 TSP requests; and TSP requestors tended to be associated with large manufacturing organizations.

In addition, 1968 requestors were mostly interested in TSP's dealing with electrical, mechanical, and materials subject areas. Finally, the twelve most frequently requested TSP's during 1968 accounted for 23.1 percent of all 1968 requests. The most frequently requested Tech Brief (67-10200, "Workmanship Standards for Fusion Welding") accounted for 6.9 percent of the total 1968 requests.

SECTION III. REQUESTOR INVOLVEMENT IN THE TECHNICAL SUPPORT PACKAGE PROGRAM

The NASA-AEC Technical Support Package program may be viewed as a communication system. The interrelated elements of the program include message generators and senders within NASA and AEC, certain identifiable channels through which the aerospace generated information is transmitted, and the intermediate and ultimate receivers and appliers of the information.

This section indicates progress made to date in attempting to understand how people outside of NASA and AEC become involved in the TSP program. The focus here is on TSP requestors, the organizations to which they belong, the topics they are interested in, how they apply the information they receive, and their ratings of the overall usefulness of TSP's.

Information presented was derived from the PATT Transfer Data Bank. At the time the data were cross tabulated, the Data Bank included 20,476 total cases and represented TSP request letters PATT had received from June 1966 through mid-October 1968.*

Organizational Size and Sources of Awareness

The table below presents data on the number of employees in requestor organizations and the sources they first used to learn about the availability of specific TSP's (see Appendix C, Table C-1):

Source of Requestor Awareness	Organizational Size: Undetermined (N=2,872)**	Less Than 500 Employees (N=1,500)	500 to 5,000 Employees (N=934)	5,000 or More Employees (N=3,094)
NASA	27.1%	30.8%	56.2%	57.4%
Small Business Administration	48.0	47.7	19.7	4.0
Trade Press	14.9	12.1	7.6	21.8
Professional Publications	4.3	4.3	7.3	8.3
Other (e.g., personal contact, State Technical Services)	5.7	5.1	9.2	8.5
TOTALS	100.0%	100.0%	100.0%	100.0%

* This contrasts with data presented in Section II which dealt only with TSP request letters received during calendar year 1968.

** "N" refers to the number of requestors included in each column of the table.

The sources used differed substantially according to the sizes of the organizations in which requestors were employed. Requestors in small firms (fewer than 500 employees) learned about the availability of TSP's mostly (47.7 percent) through the Small Business Administration (SBA). By contrast, requestors in medium-sized and large organizations principally learned about particular TSP's through such NASA publications as the Tech Brief (in about 57 percent of the cases).

The finding that TSP requestors in small firms tended to rely heavily on the SBA for exposure to new technological information is worth noting. It appears that this channel of communication (SBA) is serving an important role in the dissemination of NASA or AEC developed technology.

It is interesting to note that few requestors, regardless of organizational size, cited professional publications as the sources through which they first learned about the availability of specific TSP's. This suggests that some additional attention might be given to ways of more fully integrating such publications into the TSP program effort.

An attempt was made to determine whether the sources used differed from state to state. For this analysis, the states were divided into two categories: high TSP request states (800 or more requests per state) and low TSP request states (less than 800 requests per state).* Shown in the following table are the sources cited by requestors in the two categories of states (see more detailed data in Appendix C, Table C-2):

Source of Requestor Awareness	Location of Requestor Organization	
	High Request States (N=5,411)	Low Request States (N=3,655)
NASA Publications	40%	37%
SBA and Other**	39	40
Trade and Professional Publications	21	23
TOTALS	100%	100%

* States with 800 or more TSP requests per state include California, Illinois, Massachusetts, New Jersey, New York, Ohio and Pennsylvania. These seven states accounted for approximately 60 percent of all TSP requests in 1968 (see Section II).

** SBA was cited as principal source of TSP awareness by 2,410 requestors. For analytical purposes, miscellaneous sources of requestor awareness not included in the NASA or Trade/Professional publications categories were combined arbitrarily with the SBA category.

The findings indicate that the sources used by requestors were almost identical between high and low request states. NASA publications and the SBA were cited much more frequently than professional and trade publications as sources for first learning about the availability of specific TSP's.

Subject Areas

The TSP's ordered by requestors have been grouped by NASA into six subject areas. The number of requests for TSP's in each area is shown below (see more detailed data in Appendix C, Table C-3 and C-4):

TSP Subject Area	Request Frequency	Percent
Electrical (Electronic)	8,287	40.5
Materials (Chemistry)	5,646	27.6
Mechanical	3,959	19.3
Physical Sciences (Energy Sources)	1,601	7.8
Computer Programs	496	2.4
Life Sciences	352	1.7
Unclassified (as of 10/31/68)	135	0.6
TOTALS	20,476	100.0

Data reported in the following two tables suggest that the pattern of TSP requests in all subject areas tended to remain constant regardless of the sizes and Standard Industrial Classifications (SIC's) of the requestor organizations:

	Organizational Size*		
TSP Subject Area	Less Than 500 Employees (N=6,573)	500 to 5,000 Employees (N=4,260)	5,000 or More Employees (N=9,129)
Electrical (Electronic)	42%	41%	39%
Materials (Chemistry)	22	30	30
Mechanical	27	17	16
Physical Sciences (Energy Sources)	5	8	10
Computer Programs	2	3	3
Life Sciences	2	1	2

* The 6,113 requestor organizations originally classified as being of "undetermined" size were grouped with organizations with fewer than 500 employees for purposes of cross tabulations. The principal justification for this was the assumption that the sizes of many requestor organizations were not reported in standard reference sources either because the organizations were too small or too new.

TSP Subject Area	Organizational SIC* High Request SIC's (N=11,985)	Low Request SIC's (N=7,977)
Electrical (Electronic)	42%	38%
Materials (Chemistry)	26	29
Mechanical	20	21
Physical Sciences (Energy Sources)	8	8
Computer Programs	2	3
Life Sciences	2	1

Requestor Applications of TSP's

The questionnaire sent to requestors of TSP's focuses, to a large extent, on the uses made of the information in TSP's. Data are presented here on the applications requestors made of TSP's, with special emphasis on the relationship of TSP applications to organizational size and TSP subject area.

The following table shows the various uses of TSP's reported by requestors responding to the TSP questionnaire:

Uses Made of TSP's	Requestor Responses	Percent
Current Awareness	2,603	44.5
Provided Information of Limited Value	1,958	33.4
Provided Information of Great Value	481	8.2
Resulted in a Commercial Product or New Process	30	0.5
Other	267	4.6
Of No Value; Not Applicable	513	8.8
TOTALS	5,851	100.0

* For this analysis, the SIC codes of requestor organizations were divided between High Request SIC's (700 or more requests per SIC) and Low Request SIC's (less than 700 requests per SIC). High Request SIC's included Electrical Machinery, Nonelectrical Machinery, Educational Services, Chemicals, Federal Government, and Individuals.

Almost one-half (44.5 percent) of the respondents indicated that the TSP's were used primarily for keeping updated on developments in their respective fields of interest. Another 46.7 percent reported that the TSP's were used in a more specific way (e.g., in solving a problem or developing a new product).*

In general, the applications made of TSP's were very similar in organizations of different sizes (see more detailed data in Appendix C, Table C-5):

Applications Made of TSP's	Organizational Size (Number of Employees) Undetermined (N=1,455)	Less Than 500 (N=786)	500 to 5,000 (N=817)	5,000 or More (N=2,793)	Totals (N=5,851)
Current Awareness	42.9%	46.8%	44.9%	44.5%	44.5%
Provided Information of Limited Value	31.1	32.1	36.4	34.3	33.5
Provided Information of Great Value	9.2	7.0	7.8	8.2	8.2
Resulted in a Commercial Product or New Process	0.8	0.9	0.0	0.4	0.5
Other	5.2	3.7	4.0	4.7	4.6
Of No Value; Not Applicable	10.8	9.5	6.9	8.0	8.7
TOTALS	100.0	100.0	100.0	100.0	100.0

Some exceptions to the general pattern of TSP applications were noted in medium-sized organizations ordering TSP's in certain subject areas:

* Examples of specific uses made of TSP's in solving problems are presented in Section IV of this report and in previous PATT Quarterly Reports.

Applications of TSP's in Medium-Sized Organizations	Subject Areas of TSP's					
	Electrical (N=525)	Materials (N=497)	Mechanical (N=150)	Physical Sciences (N=95)	Computer Programs (N=42)	Life Sciences (N=21)
Problem Solving*	54%	44%	49%	40%	67%	38%
Current Awareness	37	51	43	55	28	57
No Application	9	5	8	5	5	5

Two-thirds (67 percent) of the computer program TSP's and over one-half (54 percent) of the electrical TSP's were used primarily for problem solving purposes, exceeding the 47 percent average of problem solving application of all TSP's. Similarly, the current awareness applications of TSP's in the physical sciences and life sciences areas were substantially higher than TSP's for medium-sized organizations.**

Requestor Evaluations of TSP Usefulness

TSP requestors were asked to evaluate the overall usefulness of information they received from NASA, and the results were as follows:***

* For this analysis, a new category of TSP applications called "problem solving" was developed to facilitate data analysis. The problem solving category includes the following more specific categories of TSP applications: (1) TSP provided information of limited or great value to requestor's work; (2) TSP was used in developing a new product or process; and (3) miscellaneous applications.

** Cross tabulations between TSP applications and organizational location and SIC did not reveal any major deviations from the general findings reported above.

*** Usefulness was not defined for TSP requestors contacted. Instead, they were asked to rate TSP usefulness as excellent, good, fair, or poor. Since 46 percent of the requestors rated their TSP's as "good," this category was labeled "average" for this analysis.

Usefulness Rating of TSP	Frequency
Above Average	16%
Average	46
Below Average	38

The general pattern of TSP usefulness ratings did vary noticeably when examined against organizational size and TSP's in the computer program area (for more detailed data see Appendix C, Table C-6):

Usefulness Rating of Computer Program TSP's	Organizational Size: Less Than 500 Employees (N=46)	500 to 5,000 Employees (N=36)	5,000 or More Employees (N=63)
Above Average	11%	5%	10%
Average	50	42	30
Below Average	39	53	60

Sixty percent of the requestors in large organizations and 53 percent of the requestors in medium-sized organizations rated computer program TSP's as being of "below average" usefulness. By contrast, 61 percent of the requestors in small organizations rated computer program TSP's as being of average or above average usefulness.

Another exception to the overall pattern of TSP usefulness was discovered in cross tabulating usefulness with organizational size and TSP's in the life science subject area:

Usefulness Rating of Life Science TSP's	Organizational Size: Less Than 500 Employees (N=36)	500 to 5,000 Employees (N=15)	5,000 or More Employees (N=49)
Above Average	31%	20%	20%
Average	30	40	47
Below Average	39	40	33

Proportionately more (31 percent versus 20 percent) requestors in small organizations compared to those in larger organizations rated life science TSP's as being of above average usefulness in their work.

Summary

This section has presented the results of an initial attempt to integrate data contained in the Transfer Data Bank regarding requests for NASA or AEC Technical Support Packages.

The findings indicated that requestors in medium-sized and large organizations learned about the availability of TSP's mostly through NASA publications, whereas requestors in small firms learned about TSP's principally through the Small Business Administration. TSP's dealing with electrical, materials, and mechanical subject areas accounted for 88 percent of the TSP's requested; TSP's in the physical sciences, computer programs, and life sciences areas made up the remaining 12 percent. Approximately 47 percent of the TSP's were used primarily in attempts to solve specific problems; another 45 percent were applied mostly in helping requestors keep current in their respective fields of interest. Finally, a majority (62 percent) of requestors in all types of organizations tended to rank the TSP's as being of average or above average usefulness in solving problems or keeping current.

This integration effort produced some promising results. At the same time, several knowledge gaps in the research effort to date became more apparent in the process. Little is known yet, for example, about the professional characteristics of requestors, such as their fields of specialization and their responsibilities within their organizations. Neither is much known about the ways requestors integrate TSP information into their other research efforts. Nor is much known about the points in the research and development process at which TSP's are acquired and used by people in different organizations and industries. To help fill these knowledge gaps, the TSP questionnaire developed in 1967 for PATT has been substantially revised and is being field tested (see Appendix A).

SECTION IV. DOCUMENTATION OF TRANSFERS

During the first quarter of 1969, PATT staff members completed 18 telephone interviews. Four of the cases are included in Appendix D, and 14 more will be incorporated into subsequent reports. One of the most significant, the evolution of Maxwell Laboratories, is presented in this section.

Screening of questionnaire responses received during the past three months indicates that there will be opportunities for at least 50 telephone follow-up interviews next quarter.

Work has started on the analysis of the 300 plus cases developed in 1968. Content of the cases will be analyzed in a systematic way, and the preliminary results of the content analysis will be included in the next quarterly report.

Case Number: 81220299

FOLLOW-UP REPORT

One result of a Lewis Research Center contract with General Dynamics Corporation for electric propulsion systems research was the establishment of a new spin-off company, Maxwell Laboratories, Inc., formed by three former General Dynamics employees in August 1965.

Subject	Technology Source
Maxwell Laboratories, Inc. 9244 Balboa Avenue San Diego, California 92123 714-279-5100 Contact: Dr. Terence J. Gooding President	General Dynamics Corporation

Contract NAS-3-2594 between Lewis Research Center and General Dynamics Coproration in San Diego was related to electric propulsion systems. As a portion of the system, it was necessary to develop low impedance pulse lines for use with plasma accelerators. It was recognized by Dr. Terence Gooding and his associates that energy storage capacitor technology was lagging and that there was the opportunity for significant technological advancement. Advances were desired in both weight and reliability for airborne items, and capacitors with these characteristics were unavailable on the commercial market. Therefore, it was necessary that General Dynamics personnel develop and fabricate the desired capacitors.

One important result of the NASA contract was that it demonstrated the need for capacitors with different capabilities. Dr. Gooding reported that, "It exposed us to a market that was not being served by the major companies in the capacitor field." (Gooding also reported that the NASA research project served to provide him personal experience about how to manage research programs.) Although General Dynamics management was encouraged by Gooding and Bruce Hayworth to enter this market, it was reluctant to enter a limited market and to become involved with component manufacturing. Therefore, the three employees left and formed Maxwell Laboratories, Inc. in August 1965. The company was named after James Clerk Maxwell, a British physicist, who developed the theory of electromagnetic wave propagation in 1864.

Case Number: 81220299 (Cont.)

In the case of Maxwell Laboratories, financing has not been the problem often encountered by smaller, new, technologically oriented firms. An investment group of substantial and well-known private, business oriented investors has supported this enterprise since its creation. The company is privately held although it might go public in the future.

The original objective of Maxwell Laboratories was to serve the market identified earlier with emphasis on high voltage equipment. Today, the company is engaged in systems engineering as well as component manufacturing, and less than two-thirds of its business is related to government. Almost two-thirds of its sales are in components and systems while the other third is related to research and development contracts. Further, less than seven percent of its sales were to NASA in the past fiscal year. The long term objective is to become mainly a component producer with switches and power supplies being the major items. In order to accomplish this, it is necessary to have capacity to design pulse power systems. Applications are in such areas as oceanographic sounding, laser systems, pulsed optical systems for photocopying, and various high-speed electromechanical devices.

As a result of its high-speed electromechanical device activity, the company has recognized a need for related control systems and is now undertaking work in the industrial control field.

A program of acquisition and diversification was initiated in the fall of 1968 when the company acquired Aptron, an Oregon-based manufacturer of quality high voltage power supplies. In addition to their use as components of Maxwell's pulsed power systems, these power supplied are sold for use in paint sprayers, X-ray systems, electrostatic precipitators and for other uses. The Aptron operation will be fully integrated into Maxwell when a building addition is completed early in 1969.

Toward the end of 1968, Maxwell entered into an exclusive agreement with Emile Haefely and Co., Ltd. of Basle, Switzerland, to market and service Haefely products in the United States. Haefely, founded in 1904, is an internationally respected manufacturer of high voltage equipment for the electrical power and utilities industries. The Maxwell-Haefely agreement provides for a pooling of scientific and engineering talent for application to projects in the United States and permits mutual consultation on a worldwide basis.

Case Number: 81220299 (Cont.)

The market served by Maxwell demands custom work and has been neglected by the major companies. Gooding views it as one a small company can fill best. The manufacturing operation within Maxwell corresponds to the needs of the market since it is primarily custom in nature without traditional production lines. The maximum production lot size produced does not usually exceed 25 although a limited number of components are produced for inventory.

Dr. Gooding, the company president, received his terminal degree from the University of Minnesota with a major in Physics in 1958. His undergraduate degree was also in Physics from the University of Wales in 1955.

Maxwell Laboratories, Inc. employs 138 people including 35 engineers. It is projected that 175 will be employed by mid-1969.

General Dynamics reported the idea under the new technology reporting requirements. Tech Brief 66-10291, "Large Capacitor Performs as a Distributed Parameter Pulse Line," was authored by Gooding and others and published in July 1966.

No sales have resulted from the mention of Maxwell Laboratories in the Technical Support Package associated with the Tech Brief although intangible benefits are present, and it has stimulated inquiries.

TDB:DCC:ml
12/10/68

SECTION V. SUMMARY OF TAC/DRI EXPERIMENT

A primary purpose of PATT is to enhance the effectiveness of NASA's Technology Transfer Program by developing a better understanding of the technology transfer process. One of the specific tasks carried out to meet this objective was an experiment involving the University of Denver's Research Institute and the University of New Mexico's Technology Application Center (TAC). TAC is one of six Regional Dissemination Centers. DRI subscribed to the services of TAC over a six month period and the entire process was closely monitored and evaluated by PATT staff members.

Within DRI, professional staff members in six divisions (Chemistry, Electronics, Industrial Economics, Mechanics, Metallurgy, and Physics) received 15 retrospective searches. Three additional staff members received TAC's selective dissemination service. The purposes of the retrospective searches ranged from pre-proposal review of the literature, to proposal preparation, identification of knowledgeable individuals in a field, check on a dissertation bibliography, and maintenance of an awareness in a scientific field.

The major advantages perceived by participants in the experiment were:

- Increased confidence level of a previously conducted manual search
- Uncovered new information
- Saved time valued at an estimated $1,721 in direct costs
- Identified a void in past research and thus uncovered a potential research opportunity
- Speed of response

The major negative aspects of TAC's retrospective search service were communications difficulties between DRI staff members and TAC personnel, lack of access to classified literature, lack of timeliness in the data base, loss of a learning experience typically associated with a manual search, and the omission of key articles.

The authors' major conclusions, after monitoring the experiment and analyzing the evaluation of individual participants, were:

- The NASA data base is not adequate for the purposes of most DRI needs. Therefore the augmentation service offered by TAC is a valuable part of the total service.

- The services of TAC are no panacea for individual researchers. A TAC retrospective search usually increases the confidence level of a researcher in his own efforts, but in no case was it completely sufficient in itself.

- The usefulness of a TAC retrospective search is related to the researcher's level of sophistication in a particular field. If a researcher is moving into a new but related field of endeavor, the search is more likely to be viewed as valuable than a search made in the researcher's principal field.

- The possible loss of a learning experience because of not manually searching the literature may be offset by the experience gained in dealing with a computerized information storage and retrieval system, and by the necessity for more carefully defining search strategy and objectives.

- The lack of access to classified information, although mentioned by some participants, does not appear to be a serious problem. Individuals engaged in classified research projects usually have other resources at their disposal.

- On the question of relevancy versus recall, DRI participants prefer to have a larger quantity of information even though it means looking at more irrelevant abstracts.

- In comparing retrospective versus current awareness searches, there was little demand for current awareness service, and those who did participate generally were disappointed in the results. This is contrary to the experience of some other Regional Dissemination Centers.

- An internal champion in the user institution appears to be an essential element for achieving customer utilization and satisfaction. The service does not sell itself.

It was recommended to DRI management, at a briefing held on February 25, 1969, that it subscribe to the services of the Technology Application Center. It was recommended to TAC, in dealing with a customer like DRI that: (1) TAC be careful not to build customer expectations above a reasonable level; (2) TAC continue to augment searches and to do a better job of explaining how the augmentation is accomplished; and (3) TAC establish communications on a more formal basis with selected participants to avoid any misunderstanding over the purpose of a specific search.

APPENDIX A

Revised TSP Questionnaire

University of Denver
COLORADO SEMINARY

DENVER RESEARCH INSTITUTE UNIVERSITY PARK, DENVER, COLORADO 80210

QUESTIONS CONCERNING THE NASA TECHNICAL SUPPORT PACKAGE

We would greatly appreciate your help in providing the information requested in this questionnaire. It will be of value to NASA personnel responsible for the Technology Utilization Program. Please answer by checking appropriate boxes.

1. How did you first learn about the availability of the NASA Technical Support Package (TSP) referred to in the cover letter?

   ☐ From someone in my own organization
   ☐ From someone outside of my organization
   ☐ From the Small Business Administration
   ☐ Read about this TSP in a professional or trade publication
   ☐ Read a NASA Tech Brief announcing this TSP
   ☐ Read about this TSP somewhere else
   ☐ Other (specify): _____

2. If you first learned about the TSP in a NASA Tech Brief, how did you acquire the Tech Brief?

   ☐ Did not learn about TSP in a Tech Brief
   ☐ Received the Tech Brief directly from NASA
   ☐ Received the Tech Brief as part of internal distribution within my organization
   ☐ Other (specify): _____

3. What was your most important reason for ordering this particular TSP?

   ☐ To keep abreast of developments in my field(s) of interest
   ☐ To assist in solving a specific problem or in getting the most up-to-date answer to a particular question
   ☐ To assist others in my organization in their research and development activities
   ☐ Other (specify): _____

4. What is your estimate of the number of hours you and other members of your organization spent in reviewing, studying or applying information contained in the TSP you ordered?

   _____
   Hours

5. Identify the stage of technical or scientific work during which this TSP was requested:

   ☐ Preparation or evaluation of a proposal, plan, or outline of technical work to be done
   ☐ Design or development of a particular product or process
   ☐ Preparation or evaluation of technical reports
   ☐ Collection of background information which appeared to have potential usefulness to me or my organization
   ☐ Other (describe): _____

6. How was this TSP *primarily* used?

   ☐ To help solve a specific problem
   ☐ Passed it along to someone else for possible use
   ☐ Reviewed and filed it for future reference
   ☐ Discarded it
   ☐ Other (specify): _____

7. If you used the TSP for problem solving, how important was it in the solution of that problem?

   ☐ Not important at all (irrelevant, not applicable)
   ☐ Slightly important (less than 5% input to problem solution)
   ☐ Moderately important (about 5% to 15% input to solution)
   ☐ Quite important (15% or greater input to solution)
   ☐ Did not use it for problem solving

8. Please rate the information contained in the particular TSP you ordered in terms of each of the sets of words below. Make a check mark (✓) in the appropriate space for *each* pair of words. [Do not omit any of the items and place only one check mark on any one set of words.]

TSP RATING

important ___:___:___:___:___ unimportant
old ___:___:___:___:___ new
complete ___:___:___:___:___ incomplete
unclear ___:___:___:___:___ clear
unusual ___:___:___:___:___ usual
relevant ___:___:___:___:___ irrelevant
helpful ___:___:___:___:___ unhelpful
superior ___:___:___:___:___ inferior
useless ___:___:___:___:___ useful
poor reproduction ___:___:___:___:___ good reproduction

9. What is your primary job (check only one)?

- ☐ Scientist
- ☐ Engineer
- ☐ Teacher
- ☐ Librarian
- ☐ Technician
- ☐ Other (specify): _____

10. What type of an organization do you work for (check only one)?

A Manufacturing Organization
- ☐ Electrical Machinery
- ☐ Nonelectrical Machinery
- ☐ Transportation Equipment
- ☐ Other Manufacturing (specify): _____

A Service Organization
- ☐ Educational
- ☐ Business
- ☐ Medical and Other Health Services
- ☐ Research
- ☐ Other (specify): _____

A Government Agency
- ☐ Federal
- ☐ State
- ☐ Local
- ☐ Other (specify): _____

Another Type of Organization
- ☐ (Specify): _____

Self-employed
- ☐ Consultant
- ☐ Writer
- ☐ Other (specify): _____

11. Please check the appropriate category for your annual income level.

- ☐ Less than $12,500
- ☐ $12,500 or more

12. What is the highest completed level of your formal schooling?

- ☐ Less than a bachelor's degree
- ☐ B.A., B.S., or equivalent
- ☐ M.A., M.S., or equivalent
- ☐ Ph.D. or equivalent
- ☐ Other (please specify): _____

13. How large is the organization for which you work?

- ☐ Self-employed
- ☐ 1 to 5 employees
- ☐ 6 to 50 employees
- ☐ 50 to 500 employees
- ☐ 500 to 1,000 employees
- ☐ 1,000 to 5,000 employees
- ☐ 5,000 to 10,000 employees
- ☐ 10,000 employees or more

14. Do some of your responses contain proprietary information? If yes, please indicate which ones. No information which you identify as proprietary will be associated with you or your organization.

- ☐ Yes (specify): _____
- ☐ No

Your Name: _____ Your Title: _____ Today's Date: _____

Please return completed questionnaire to:

University of Denver
PATT
P.O. Box 10127
Industrial Economics Division
Denver Research Institute
Denver, Colorado 80210

APPENDIX B

1968 Transfer Data Bank Information Referenced in Section II

TABLE B-1. 1968 TSP REQUEST FREQUENCY BY MONTH AND CENTER

CENTER	1968 Month													
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Unknown	TOTAL
Marshall	628	311	564	549	401	321	623	406	596	663	686	693	0	6,441
Lewis Research Center	283	363	189	435	229	91	186	100	178	195	110	98	1	2,458
Manned Spacecraft Center	124	64	93	160	58	197	250	124	209	222	157	160	0	1,818
Goddard Space Flight Center	96	66	99	247	149	190	226	126	61	95	57	98	0	1,510
Space Nuclear Propulsion Office	69	59	47	84	23	3	0	0	227	724	39	131	1	1,407
Ames Research Center	68	77	31	132	15	277	131	104	63	241	130	52	0	1,321
Jet Propulsion Lab	125	50	25	150	95	66	22	40	49	36	32	59	0	749
Argonne National Laboratory	0	0	0	13	0	0	0	0	0	0	0	1	574	588
Kennedy Space Center	41	51	102	124	36	1	15	22	23	21	17	45	0	498
Langley Research Center	79	12	18	21	12	12	40	68	23	19	40	31	0	375
NASA Headquarters	4	8	0	0	0	54	5	2	2	2	0	1	0	78
Flight Research Center	7	5	1	2	2	0	8	3	7	10	6	7	1	59
Electronics Research Center	0	3	13	3	4	2	5	0	3	0	3	16	0	52
NASA Pasadena Office	1	0	0	0	0	0	0	0	0	0	1	5	0	7
Wallops Station	1	0	2	0	0	0	0	0	0	0	0	0	0	3
Aerospace Research Application Center	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Sandia	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Technology Use Studies Center	0	1	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL	1,526	1,070	1,184	1,920	1,024	1,216	1,511	995	1,441	2,228	1,278	1,397	577	17,367

TABLE B-2. LOCATION OF 1968 TSP REQUESTORS

Organizational Location	Requestor Frequency	Organizational Location	Requestor Frequency
Alabama	128	North Carolina	165
Alaska	11	North Dakota	7
Arizona	171	Ohio	1,305
Arkansas	13	Oklahoma	130
California	2,642	Oregon	82
Colorado	229	Pennsylvania	1,423
Connecticut	497	Rhode Island	94
Delaware	62	South Carolina	49
Florida	259	South Dakota	26
Georgia	60	Tennessee	197
Hawaii	15	Texas	694
Idaho	26	Utah	96
Illinois	885	Vermont	48
Indiana	569	Virginia	194
Iowa	67	Washington	242
Kansas	101	Washington, D. C.	247
Kentucky	76	West Virginia	104
Louisiana	156	Wisconsin	415
Maine	57	Wyoming	4
Maryland	343	Puerto Rico	0
Massachusetts	857	Africa-Asia	26
Michigan	678	Australia	5
Minnesota	249	Belgium	5
Missouri	206	Canada	52
Mississippi	30	France	6
Montana	22	Great Britain	183
Nebraska	30	Italy	2
Nevada	22	Japan	11
New Hampshire	102	Sweden	4
New Jersey	860	West Germany	10
New Mexico	102	Latin-America	5
New York	1,988	Other Europe	23
		TOTAL	17,367

TABLE B-3. DISTRIBUTION OF 1968 TSP REQUESTS BY STANDARD INDUSTRIAL CLASSIFICATIONS

SIC Code	Industry	TSP Requests Frequency	Percent
00	Individual	788	4.5
07	Agricultural Services	3	0.0
10	Metal Mining	32	0.2
13	Crude Petroleum and Natural Gas	178	1.0
14	Mining, Nonmetallic Minerals	5	0.0
15	Building Construction	18	0.1
16	Other Construction	9	0.1
17	Construction	15	0.1
19	Ordnance and Accessories	77	0.4
20	Food Products	23	0.1
21	Tobacco	1	0.0
22	Textiles	48	0.3
23	Apparel, Fabric Products	14	0.1
24	Lumber and Wood Products	8	0.0
25	Furniture	15	0.1
26	Paper Products	71	0.4
27	Printing	92	0.5
28	Chemicals	798	4.6
29	Petroleum Refining	37	0.2
30	Rubber, Plastics	123	0.7
31	Leather and Leather Products	3	0.0
32	Stone, Clay and Glass Products	220	1.3
33	Primary Metals	461	2.7
34	Fabricated Metals	444	2.6
35	Nonelectrical Machinery	1,444	8.3
36	Electrical Machinery	2,886	16.6
37	Transportation Equipment	1,220	7.0
38	Scientific Instruments	982	5.6
39	Miscellaneous Manufacturing	125	0.7
40	Railroad Transportation	3	0.0
42	Motor Freight	3	0.0
44	Water Transportation	3	0.0
45	Air Transportation	28	0.2
46	Pipeline Transportation	2	0.0
47	Transportation Services	2	0.0
48	Communications	42	0.2
49	Electricity, Gas, Sanitary Service	61	0.4

TABLE B-3 (Continued)

SIC Code	Industry	TSP Requests Frequency	TSP Requests Percent
50	Wholesale Trade	228	1.3
52	Building Materials, Hardware, Farm Equipment	1	0.0
53	Retail Trade, General Merchandise	4	0.0
55	Auto Dealers, Gas Service Stations	3	0.0
57	Furniture and Furniture Stores	4	0.0
59	Miscellaneous Retail	2	0.0
60	Banking	6	0.0
61	Other Credit Agencies	5	0.0
62	Brokers, Securities	1	0.0
63	Insurance Carriers	15	0.1
64	Insurance Agents	2	0.0
65	Real Estate	1	0.0
67	Holding, Investment Companies	70	0.0
72	Personal Services	40	0.2
73	Miscellaneous Business Services	563	3.2
75	Auto Repair	1	0.0
76	Miscellaneous Repair Service	20	0.1
78	Motion Pictures	1	0.0
79	Amusement	2	0.0
80	Medical, Health Services	178	1.0
81	Legal Services	1	0.0
82	Educational Services	1,348	7.7
84	Museums, Art Galleries, Zoological Gardens	1	0.0
86	Nonprofit Membership Organizations	7	0.0
89	Miscellaneous Services	376	2.2
91	Federal Government	1,412	8.1
92	State Government	53	0.3
93	Local Government	14	0.1
94	International Government	5	0.0
	TOTALS	17,367	100.0

APPENDIX C

PATT Transfer Data Bank Information Referenced in Section III

TABLE C-1. SIZE OF REQUESTOR ORGANIZATION BY SOURCE OF REQUESTOR AWARENESS

Source of Requestor Awareness	Organizational Size (Number of Employees)								
	Undetermined	1-10	11-50	51-100	101-500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	10,001 and More
NASA Tech Brief	653	130	31	15	211	167	295	298	1,271
Other NASA Publications	126	23	10	5	37	14	49	42	165
Small Business Administration	1,387	335	145	67	169	66	118	28	95
Trade Press	429	91	9	12	69	39	132	100	575
Professional Publications	122	35	2	3	24	16	52	43	213
Personal Contacts	64	13	1	1	11	8	31	21	105
State Technical Services	15	3	0	0	0	1	1	3	9
Other	85	39	1	2	6	10	35	19	107
TOTALS	2,881	669	199	105	527	321	713	554	2,540

TABLE C-2. ORGANIZATIONAL LOCATION BY ORGANIZATIONAL SIZE BY SOURCE OF REQUESTOR AWARENESS

Source of Requestor Awareness	HIGH REQUEST STATES				LOW REQUEST STATES			
	Organizational Size				Organizational Size			
	Small	Medium	Large	Totals	Small	Medium	Large	Totals
NASA Publications	673	595	910	2,178	399	270	695	1,364
Trade or Professional Publications	382	244	495	1,121	310	138	397	845
SBA and Other*	1,604	254	254	2,112	1,103	112	231	1,446
TOTALS	2,659	1,093	1,659	5,411	1,812	520	1,323	3,655

* SBA was cited as principal source of TSP awareness by 2,410 requestors. For analytical purposes, miscellaneous sources of requestor awareness not included in the NASA or trade/professional publications categories were combined arbitrarily with the SBA category.

TABLE C-3. SIZE OF REQUESTOR ORGANIZATION BY TSP SUBJECT AREA

Number of Employees in Requestor Organization	Number of Requests TSP SUBJECT AREA						
	Undetermined	Electrical	Materials	Mechanical	Physical Sciences	Computer Programs	Life Sciences
Undetermined	58	2,750	1,663	1,556	456	126	138
1-10	4	532	243	564	74	13	31
11050	6	165	54	114	20	3	0
51-100	1	109	48	42	11	2	2
101-500	3	492	289	213	64	33	11
501-1,000	3	334	192	120	57	26	11
1,001-5,000	15	723	537	248	139	60	24
5,001-10,000	7	566	444	189	138	25	20
10,001 or More	38	2,616	2,176	913	642	208	115
TOTALS	135	8,287	5,646	3,959	1,601	496	352

TABLE C-4. ORGANIZATIONAL SIZE BY ORGANIZATIONAL SIC BY TSP SUBJECT AREA*

TSP Subject Area	SMALL REQUESTOR ORGANIZATIONS SIC's Categories High Request SIC's	Low Request SIC's	Totals	MEDIUM-SIZED REQUESTOR ORGANIZATIONS SIC's Categories High Request SIC's	Low Request SIC's	Totals	LARGE REQUESTOR ORGANIZATIONS SIC's Categories High Request SIC's	Low Request SIC's	Totals
Electrical	1,360	1,395	2,755	1,058	687	1,745	2,635	919	3,554
Materials	714	744	1,458	657	594	1,251	1,778	983	2,761
Mechanical	1,057	724	1,781	345	393	738	956	547	1,503
Physical Sciences	165	171	336	177	178	355	600	299	899
Computer Programs	45	57	102	52	63	115	173	91	264
Life Sciences	56	85	141	34	22	56	123	25	148
TOTALS	3,397	3,176	6,573	2,323	1,937	4,260	6,265	2,864	9,129

* The Standard Industrial Classification (SIC) codes of requestor organizations were divided between High Request SIC's ($N \geq 700$ requests) and Low Request SIC's ($N < 700$ requests). Organizational SIC's with 700 or more TSP requests included Electrical Machinery, Nonelectrical Machinery, Educational Services, Chemicals, and Federal Government organizations, plus individuals acting alone.

TABLE C-5. ORGANIZATIONAL SIZE BY TSP SUBJECT AREA BY TSP APPLICATION

TSP Subject Area	SMALL REQUESTOR ORGANIZATIONS				MEDIUM-SIZED REQUESTOR ORGANIZATIONS				LARGE REQUESTOR ORGANIZATIONS			
	TSP Application				TSP Application				TSP Application			
	Current Awareness	Problem Solving	No Application	Totals	Current Awareness	Problem Solving	No Application	Totals	Current Awareness	Problem Solving	No Application	Totals
Electrical	346	344	93	783	196	284	45	525	449	484	66	999
Materials	285	302	62	649	255	216	26	497	425	416	76	917
Mechanical	143	143	28	314	64	74	12	150	117	163	37	317
Physical Sciences	46	39	17	102	52	38	5	95	106	99	27	232
Computer Programs	23	22	3	48	12	28	2	42	28	33	7	68
Life Sciences	19	19	4	42	12	8	1	21	24	24	2	50
TOTALS	862	869	207	1,938	591	648	91	1,330	1,149	1,219	215	2,583

TABLE C-6. ORGANIZATIONAL SIZE BY TSP SUBJECT AREA BY TSP USEFULNESS

TSP Subject Area	SMALL REQUESTOR ORGANIZATIONS Usefulness				MEDIUM-SIZED REQUESTOR ORGANIZATIONS Usefulness				LARGE REQUESTOR ORGANIZATIONS Usefulness			
	Above Average	Average	Below Average	Totals	Above Average	Average	Below Average	Totals	Above Average	Average	Below Average	Totals
Electrical	137	306	276	719	71	217	183	471	147	451	338	936
Materials	114	256	207	577	78	222	156	456	122	390	307	819
Mechanical	67	123	102	292	16	54	69	139	40	129	115	284
Physical Sciences	14	42	32	88	12	38	34	84	25	89	90	204
Computer Programs	5	23	18	46	2	15	19	36	6	19	38	63
Life Sciences	11	11	14	36	3	6	6	15	10	23	16	49
TOTALS	348	761	649	1,758	182	552	467	1,201	350	1,101	904	2,355

APPENDIX D

Four Case Studies of Technology Transfer Through the TSP Program

Case Number: 80201589

FOLLOW-UP REPORT

The Lipe-Rollway Corporation has applied for a patent on a clutch vibration damping method based on information first supplied by NASA's Lewis Research Center.

Subject	Technology Source
Lipe-Rollway Corporation 4522 Wetzel Road Liverpool, New York 13088 315-488-5411 Contact: Jack W. Armstrong, Corporate Manager, Research and Development	Lewis Research Center Tech Brief: 66-10666

Among Lipe-Rollway's product lines is a line of clutches for heavy duty truck use. These clutches are sold to both the OEM and replacement markets.

One difficulty encountered in truck drive trains is the tendency of engine vibration transmitted through the drive train to impart excessive stress and wear to the gear mechanisms at either end of the drive train. To combat this, Lipe-Rollway offers in its clutches vibration damping mechanisms which, although helpful, are not completely successful in damping out vibrations.

Especially troublesome are the vibrations encountered in low rpm heavy duty diesel engines. Based on a damping idea utilizing wires which NASA's Lewis Research Center applied to compressor blade problems, Lipe-Rollway's Research Development Center has developed a damping mechanism for use on low rpm diesel engine clutches.

A patent has been applied for covering this mechanism, and units have been prototyped and tested. Presently, Lipe-Rollway is testing units in the field.

Mr. Armstrong stated that the idea for the damping device was triggered by the information in the NASA Tech Brief. Lipe-Rollway's Research

Case Number: 80201589 (Cont.)

Development Center is a regular receiver of NASA Tech Briefs and other material. Mr. Armstrong stated that generally the quality of the material is good.

ROM:ml
6/27/68

Case Number: 80813140

FOLLOW-UP REPORT

The Winter Manufacturing Company evaluated development costs and production savings which would result from possible future use of the inorganic paint developed at Goddard Space Flight Center.

Subject	Technology Source
Winter Manufacturing Company 2604 Southwest MacAdam Avenue Portland, Oregon 97201 503-227-1137 Contact: Mr. Victor M. Schmidt	Goddard Space Flight Center Tech Brief: 65-10156

The Winter Manufacturing Company manufactures furniture trim. Among the items produced by Winter are furniture handles which are painted with baked enamel. Mr. Schmidt stressed that the paint used on these handles must be of a very durable nature. He noted that the interest in inorganic paint was prompted by its durability, and the fact that it could be applied without the baking process used presently. He noted that the inorganic paint would be particularly good for furniture shipped to foreign countries because shipping and storage procedures in foreign countries are often very hard on normal paints. However, he said that despite these benefits, the development and use of this paint was too expensive at the present time for his company.

Mr. Schmidt noted that his inquiry about the inorganic paint was motivated by a well-defined need. He thought that the NASA information would involve a considerable savings in time and development costs if development were carried out.

The Winter Manufacturing Company learned of the inorganic paint when four of its employees attended a Small Business Administration (SBA) meeting in Seattle, Washington. Mr. Schmidt estimated that about fifty hours of developmental time had been spent on this technical advancement, although this included some of the time spent by the four members at the SBA meeting. The Winter Company regularly receives NASA publications. The general practice is to review these publications and file the ones that seem to be pertinent to its needs.

Case Number: 80813140 (Cont.)

Mr. Schmidt thinks that the NASA publications they receive are "very good" and "very complete." He concluded by stating that although the Winter Company had stopped development on this paint, he hoped that someone else would develop it and place it on the market.

RJ:ml
2/27/69

Case Number: 80813470

FOLLOW-UP REPORT

Precision Castparts Corporation, Portland, Oregon is attempting to incorporate a newly developed foam ceramic thermal insulation material into its production process. It is planning to use this new material as an insulating lining for melting crucibles, but has had great difficulty to date in locating the materials necessary to produce it.

Subject	Technology Source
Precision Castparts Corporation 4600 S.E. Harney Drive Portland, Oregon 97206 503-777-3881 Contact: Mr. Thomas A. Hamm Foundry Superintendent	Marshall Space Flight Center Tech Brief: 67-10441

Mr. Thomas A. Hamm, Foundry Superintendent of Precision Castparts Corporation was querried about the proposed use of the NASA developed foam ceramic insulation material in his production process. The NASA idea was developed by United Aircraft Corporation, under contract to Marshall Space Flight Center. The material consists of a new inorganic insulator exhibiting the characteristics of high melting temperature, insulating efficiency, oxidation resistance, and high mechanical strength. A foam ceramic body designated (ZRP207), was developed and evaluated in the light of the above requirements. This invention reported in NASA Tech Brief 67-10441.

Mr. Hamm became aware of this idea in an article entitled "Super Foam Insulation," which appeared in the April 1968 issue of the Modern Casting Magazine. Since Precision Castparts Corporation is a casting foundry, and must use a variety of insulation techniques, Mr. Hamm thinks that it has possible use in melting and casting operations. In fact, preliminary investigation indicated that it could be used as a backup liner for melting crucibles. The new material, if possible to develop, would keep the crucibles hotter, thus reducing heat transfer and increasing efficiency. Mr. Hamm indicated that it would probably cost time, but would increase efficiency as well as saving wear on the crucible equipment. To date however, no such application has been possible since the company has not been able to locate several materials needed to make the foam ceramic insulation material. Mr. Hamm said that there were several "odd"

Case Number: 80813470 (Cont.)

elements involved which were difficult to find and quite expensive. He indicated that the company was going to try to find substitute materials so that it could at least try the foam ceramic on a trial development basis. He stated that development costs incurred to date have probably been less then $200 because many of the materials have not been available.

Mr. Hamm stated that the inquiry for information was motivated by a definite need. He pursues information regarding new techniques primarily through a review of technical magazines. In addition, the company also is in contact with various experts in the field. NASA publications are not regularly received by the company, but are selectively purchased after being featured in the trade press. Mr. Hamm was uncertain about what NASA publications his library received. Regarding his review of NASA materials, he felt there appeared to be a disclosure problem. That is, the publications usually did not outline uses of inventions or ideas, and when such information was presented, it was usually vague about results.

RJ:ml
2/27/69

Case Number: 80813325

FOLLOW-UP REPORT

The Cecil Equipment Company, Cleveland, Ohio plans to incorporate an automatic contour welding speed control system into a present product, an automatic guidance system, as soon as it receives patent information from NASA. If patent rights can be obtained, or if it appears that there will be no patent problems in the future, the company will definitely use this innovation.

Subject	Technology Source
Cecil Equipment Company 6708 Madison Avenue Cleveland, Ohio 44102 216-631-7535 Contact: Mr. Shelby Cecil President, Cecil Equipment Company	Marshall Space Flight Center Tech Brief: 68-10091

Mr. Shelby Cecil, President of the Cecil Equipment Company, requested information from NASA concerning Marshall Space Flight Center's invention involving a speed control system for an automatic contour welder. This idea involves the design of a speed control system that enables the welding torch of an automatic welder to maintain a substantially constant speed with respect to the surface being welded. The system is particularly useful when building contoured or unusually shaped surfaces which cause the distance from the work surface to the weld carriage to vary in a random manner. Mr. Cecil indicated that there was a current need for this type of capability with respect to a variety of customers. For example, when dealing with welding such as on automobile bodies, many contour welds are necessary. The new approach provides the ability to change the amperage input and allow the welding machine to maintain the same surface speed. This is a capability not presently found in Cecil's automatic guidance system and would improve the quality of resulting welds. Mr. Cecil noted that the types of customers interested in this capability would include automobile plants, bridge and iron contractors, manufacturers of nuclear vessels, certain construction contractors, and manufacturers of dome welding with automatic contour welding equipment.

Case Number: 80813325 (Cont.)

Mr. Cecil expressed a desire to incorporate this technique into the present product as soon as possible, but indicated that he would not do so until he receives information concerning patent rights. He indicated he had written NASA several months ago, but had not yet received a reply. He reported that it would be a mistake to spend development time on this innovation and then get into patent problems.

Mr. Cecil became aware of the NASA idea, when visiting a customer in Portland, Oregon. This customer was aware of the Tech Brief and had a copy. The Cecil Company is not a regular recipient of NASA publications. Mr. Cecil commented but there has always been a need for this approach, and that it probably saved several thousand dollars in development costs.

"Besides, it's a proven item." He anticipated that the speed control system would add approximately $3,000 to the price of the present product system.

Mr. Cecil indicated that the information received was extremely helpful, and it appeared that "they (NASA) did a pretty detailed job." The problem is that "we can't get an answer about patents." He noted that the Cecil Company has had trouble obtaining information on other NASA welding developments. He specifically recalled difficulty in obtaining one Tech Brief concerned with height sensing, that had possible applications. He concluded by stating if the government could put a lot more information on the market, and if the government would let patents out, it would do everybody a great deal of good.

RJ:ml
3/6/69


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