REPORT

PROJECT FOR THE ANALYSIS OF TECHNOLOGY TRANSFER

Quarterly Evaluation Report #3

13 July 1968 - 12 October 1968

Contract No. NSR 06-004-063

DENVER RESEARCH INSTITUTE
UNIVERSITY OF DENVER

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- Prepared for -

National Aeronautics and Space Administration

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DENVER RESEARCH INSTITUTE—UNIVERSITY OF DENVER

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SECTION I

PURPOSE AND SCOPE

This Quarterly Evaluation Report #3 presents information on activities of Denver Research Institute (DRI), University of Denver under Contract NSR 06-004-063 for the period July 13, 1968 through October 12, 1968. Information presented is of significance from a policy or research viewpoint with primary emphasis upon data compilations and analyses. The final report, which is due in one month, will emphasize statistical tabulations and analyses while the subject report emphasis items not to be included in the final report.

The primary purpose of the research effort is to enhance the effectiveness of the National Aeronautics and Space Administration (NASA) Technology Utilization Program. Data collection by DRI deals with requestors of Tech Brief Technical Support Packages and their evaluations of these Packages. These data are collected initially through information obtained from a copy of the request for a Technical Support Package received from NASA and participating Atomic Energy Commission (AEC) centers, and subsequently through questionnaire follow-up and, in selected instances, personal interviews. The resulting information is analyzed and recommendations are formulated.

All compiled information is stored in the files of the Transfer Data Bank. The automated portion of the Transfer Data Bank is comprised of specially selected pieces of information. (The Transfer Data Bank is explained in detail in Quarterly Evaluation Report #1, and an initial analysis of data compiled from the first 3,000 cases is contained in Quarterly Evaluation Report #2.) A computer program has been written which enables flexibility in both tabulating the stored data and in obtaining cross-correlations. This approach has proven to be an effective technique for accumulation and processing the mass of information inherent in such a research effort.

This report discusses two major research findings. One deals with potential bias built into the Transfer Data Bank resulting from non-response to follow-up efforts by DRI. An analysis of non-respondents and their characteristics has been performed and the findings are compared with the respondent's characteristics. The second research effort involves an analysis of what information seekers are willing to pay in order to obtain Technical Support Packages. Although limitations should be observed when interpreting the findings, this section could

provide a meaningful guideline for policy formulation in any future attempt to have requestors pay for information.

Another item of interest in the report is the incorporation of 10 hours of classroom instruction about technology transfer and utilization in an undergraduate course at the University of Denver. The course, titled "Technological Administration," is being taught in the College of Business Administration. An instructional outline covering the 10 hours of instruction, as developed by Professor Walter O. Fischer, is included. Documentation of the use and application of selected Technical Support Packages is also presented.

SECTION II

TECHNOLOGY TRANSFER AND UTILIZATION INSTRUCTION

The Project for the Analysis of Technology Transfer includes a University of Denver Panel of Advisors as part of its organizational structure. This Panel is comprised of representatives from several University Departments and DRI Divisions. One objective of the Panel has been to attempt to develop a better understanding of technology transfer in various academic areas within the University of Denver.

Dr. Don E. Jones, a panel member and Division Head of Administrative Sciences within the College of Business Administration, suggested that an undergraduate course titled Technological Administration might represent a suitable mechanism to partially fulfill the above objective.

The course, offered by the College of Business Administration, discusses the contributions of modern science and technology and their impact on current organizational behavior, physical science research, automation, computer applications and engineering. Emphasis is placed on the process of technological innovation, finding and evaluating technological opportunities, and management of technological planning and forecasting. Case materials supplement the basic assessment of the role of technology in modern society. This course seemed well suited for selected instructional materials dealing with technology transfer, which have subsequently been incorporated.

Previous experience suggests that the typical college student has relatively little sophistication with respect to the scope and significance of technological administration, not to mention the area of technology transfer and utilization. Based upon these considerations, it was decided to develop a comprehensive instructional outline. Of course, inclusion of study materials relevant to the technology transfer process in any course is largely the perogative of the individual instructor.

Although the outline for such instruction was prepared with a specific application in mind, it was also intended that it might have broader use in other educational courses, workshops, or special instructional programs for industrial or government users.

Professor Walter O. Fischer agreed to prepare an outline for a program of instruction about technology transfer and utilization.

Dr. Fischer and Dr. Gordon E. Von Stroh, who provided assistance in outline preparation, normally share the teaching assignment in Technological Administration. The instructional outline is shown in Appendix A.

This outline and its use during the 1968 Fall Quarter is the first step in the development and testing of technology transfer instructional materials within the University of Denver. In addition, one lecture about technology transfer is scheduled in the Graduate School of Librarianship for the Literature of the Sciences course. A graduate course within the College of Engineering in the area of Information Acquisition and Sources for the Engineering Manager is under consideration for the 1969 Winter Quarter. These and other University of Denver academic activities should encourage a broader and better understanding about the processes affecting information flow from the inventor to the innovator.

SECTION III

ANALYSIS OF QUESTIONNAIRE NON-RESPONSE

Questionnaires have been sent to almost all persons who requested Technical Support Packages (TSP) between July 1966 and April 1968. There is a six month lag between the TSP mailing and questionnaire mailing. This provides information users with time to review the information and make decisions concerning their efforts to apply it.

About half the questionnaires sent by DRI are completed and returned. Even though mailed questionnaires do not usually produce such a high response, it was necessary to examine the characteristics of the non-respondents (NR) for evidence of differences from the respondent (R) group. Discovery of appreciable differences between the two groups would suggest a need to review the follow-up procedures presently employed. Absence of significant differences would indicate that current procedures produce representative data.

The situation was explored in two ways. First, an examination was conducted of the general statistical characteristics of all information requestors for whom data were included in the Transfer Data Bank prior to January 1968. DRI questionnaires had been mailed to these persons by early August 1968. The statistical analysis began in late September, which provided over one month for questionnaire return. In order to facilitate identification of differences, if any, statistics were compiled separately for the subgroups of respondents and non-respondents.

The second investigation sought to identify the reasons for non-response. Telephone interviews were conducted with a randomly-selected group of 40 persons who had not returned the questionnaire.

Statistical Characteristics of Non-Respondents

A total of 9160 cases were in the Transfer Data Bank for the period prior to January 1968. Of these, 369 were eliminated from consideration because they had not been sent a questionnaire. (These cases usually involved either foreign inquiries or NASA intra-agency information transfers.) The remaining 8791 cases were sorted into respondent (R) and non-respondent (NR) groups and analyzed separately.

Examination of tabulations pertaining to various user characteristics did not indicate any gross differences which would suggest sources

of bias in the current data collection process. For example, R and NR groups ordered Tech Briefs by different subject areas in the same general proportions. Similarly, orders from different Transfer Mechanisms were in like proportions. Since no obvious differences were apparent in these tabulations, it was decided to study cross-tabulations of a variety of paired factors. These cross-tabulations displayed few large deviations from the average, but several appeared large enough to warrant mention.

Overall, about 49 percent of the questionnaires were not returned. Some relatively large deviations from this proportion appeared relative to company size, Standard Industrial Classification (SIC), subject, and transfer mechanism. Table 1 indicates the high and low extreme proportions of NR in each of these factors.

Table 1
(Section III)

Extreme Proportions of Non-Response to Questionnaire
(percentages)

High Extremes		Low Extremes	
Factor	Proportion NR	Factor	Proportion NR
SIZE: 1-10 Employees	60.1 (n=654)	10-50 Employees	44.0 (n=25)
SUBJECT: Mechanical	54.8 (n=1300)	Computer Programs	42.7 (n=248)
TRANSFER MECHANISMS: Headquarters	80.0 (n=25)	Ames Research Center	43.6 (n=998)
		Flight Research Center	42.2 (n=45)
		Manned Spacecraft Center	37.8 (n=196)
		Electronics Research Center	34.8 (n=66)
SIC: Crude Petrol.	67.6 (n=34)	Rubber, Plastics	39.6 (n=101)
Individuals	61.5 (n=620)	Petrol. Refining	38.3 (n=47)
Lumber, wood	57.9 (n=38)	Air Transportation	28.6 (n=21)
Printing	57.4 (n=61)	Holding, Investment Companies	25.0 (n=28)

Examination of Table 1 reveals the important fact that 96 percent of the 654 cases in size class 1 (1-10 employees) were individuals rather than small companies. This is discernible from the juxtaposition of the 620 cases in SIC 0 (Individuals) with the 654 categorized in size class 1.

It appears that the only factor in this group that might motivate concern about non-response is the matter of individuals who request NASA information for personal use. The other high proportions of non-response are probably not so out of proportion as to warrant concern. Several are derived from a small base, for example, the 68 percent NR proportion for SIC 13 (Crude Petroleum and Natural Gas) pertains to only 34 cases.

A series of scatter diagrams were plotted to obtain visual indications of regularities (or lack thereof) in the relationship of non-response with other factors: for example, NR correlated with the proportion of R's who rated their TSP's "fair" or "poor," the proportion of R's who evaluated TSP's "of no value" or "not applicable to my work," and the proportion of R's who requested secrecy for their questionnaire responses. There were no regularities. It was inferred that non-response is not correlated with any other factors about which information is available. From this evidence it was concluded that non-response has been a random phenomenon, or caused by factors which were not subject to investigation.

Results of the Telephone Inquiries: Reasons for Non-Response

Forty persons who requested NASA information but did not return the DRI questionnaire were randomly selected for telephone interviews. The purpose of the interviews was to explore their reasons for not completing and returning the questionnaire. The selection process produced a group of large companies smaller in proportion than their representation in the total population of information requestors. Also, companies for which size could not be identified, presumably small firms, were overrepresented. Table 2 presents the proportion of companies in each size group in the telephone sample and for the group of 8791.

With respect to proportions of cases represented in different subject areas, the random selection evidently resulted in a slight overrepresentation of orders for documents in the Physical Sciences (Energy Sources) area, and a slight underrepresentation of requests for Materials (Chemistry) documents. The divergence is about 5 percent in each case, which is not a significant imbalance (see Table 3).

Table 2
(Section III)

Size Comparisons

40 Telephoned Information Users and 8791 Information Users

	Percentages	
	40 Users	8791 Users
Size Unknown	47.5	28.8
1-10 Employees	5.0	7.4
11-50 Employees	0.0	0.3
51-100 Employees	0.0	0.8
101-500 Employees	0.0	5.8
501-1,000 Employees	2.5	3.5
1,001-5,000 Employees	10.0	9.3
5,001-10,000 Employees	7.5	7.7
10,001 and more Employees	27.5	36.3
	100.0	99.9

Table 3
(Section III)

Subject Area Comparisons

40 Telephoned Information Users and 8791 Information Users

	Percentages	
	40 Users	8791 Users
Electrical (Electronic)	40.0	39.9
Physical Sciences (Energy Sources)	12.5	7.1
Materials (Chemistry)	27.5	33.3
Life Sciences	2.5	2.0
Mechanical	15.0	14.8
Computer Programs	2.5	2.8
	100.0	99.9

Comparisons on the basis of industry from which requests originated were not feasible because of the small sample size chosen for telephone interviews. No single industry group originated more than five requests; therefore, the percentages in the table cells would be too small to be meaningful. Similarly, no comparison was made by specific TSP.

It was concluded that the sample of 40 was sufficiently representative of the total group to justify the next step. Telephone calls were made to the person who originated the information request and to whom the questionnaire was sent. This person was asked why he had not returned the questionnaire and other questions were explored. The reasons given have been grouped into seven categories in Table 4. Because of the small cell size that would result from cross-tabulating these responses with other information about the users, the effort was not attempted.

Table 4
(Section III)

Distribution of Reasons Given for Non-Response

	Number
Misplaced or did not receive questionnaire	12
Respondent no longer with firm or otherwise not locatable	10
"Too busy"	7
"Can't remember" (either the NASA material or the questionnaire)	7
Did not receive NASA material requested	2
Industrial Secrecy	1
Dissatisfied with NASA material	1
	40

Some of the comments made by those who were telephoned in the non-respondent survey are listed below. The quotations and paraphrased comments indicate the variety of motivations underlying non-response to the DRI questionnaire.

> The president of a small electronics firm commented that he "had received quite a few" questionnaires. At first he answered the questionnaires, but he has not done so recently since he believes that this survey is not effective. He suggested that the questionnaire be included with the NASA document. Whoever used the document could then answer the questionnaire while he still remembered the details. As it is, the questionnaires arrived so late with respect to receipt of the NASA material that rereading would be essential in many instances.

> An employee of a research institute didn't return the questionnaire because he felt unable to supply adequate answers.

> A librarian with an oil field engineering and construction firm stated that they had been disappointed with the Technical Support Packages they had received but did not want to submit a negative report. The information had been a duplication of other material. The company has not ordered any NASA information for six months.

> The R & D manager of a large electronics firm thought that the questionnaire was too detailed and complicated. Especially troublesome was the question regarding what he would have paid for the material. He believed that the same information was available elsewhere, but that the dissemination program was a good idea, considering the great amount of money that goes into the research. To him, this question assumed political significance since he interpreted its meaning as "Is the NASA project worth the money the government puts into it?"

> Research personnel employed by a major aerospace contractor were confronted with problems of secrecy, both governmental and commercial. A R & D supervisor stated that he had not "pressured" his men to return the questionnaires because of the potentially confidential nature of their work. His company often buys their Tech Briefs through the Clearinghouse in order to conceal the titles of the reports in which they are interested.

A Department of Agriculture research scientist reported that he had received two letters and questionnaires and a phone call concerning an information package that he had never requested. He had written a personal acquaintance about a research problem in hen's egg fertilization and oviposition. In return, he received a roll of film and a NASA Technical Support Package. He commented to this effect on the first DRI questionnaire, which he returned. When he received another questionnaire he "decided that a computer was duplicating itself," and did not reply.

A purchasing agent for a large chemicals corporation stated that he was receiving three or four DRI questionnaires per week, and that he ". . . doesn't have time to answer them all." Different individuals within the company order the information, but he signs all requests and therefore receives all the questionnaires. He stated that it would be impossible to follow-up the information within the company and he could not see the value of the study.

This limited inquiry identifies several reasons for not completing and returning the questionnaire. The most common reasons appear to be questionnaire misplacement and personnel mobility. The practice of central ordering of technical information by a librarian or purchasing agent deters response. Finally, the multiple mailings to heavy TSP users discourages repetitive questionnaire completion.

Based upon the examination of general statistical characteristics of all information requestors and a review of the telephone interviews, it was concluded that non-response has been a random phenomenon, or caused by factors which were not subject to investigation. Therefore, current procedures are considered to produce representative data.

SECTION IV

TSP PRICING ANALYSIS

Study Method

Cases numbered 8101 through 9100 were selected for a special study of TSP pricing. Each TSP user in this group received a special questionnaire with an additional question, "What would you or your organization have paid for the requested Technical Support Package?" Boxes were provided for a checkmark indicating the respondent's choice among seven alternatives: $1, $2, $3, $4, $5, in excess of $5, and "nothing."

When the data were tabulated, codes were added to identify two special types of reaction to the question. Code 8 was assigned to specify cases for which a questionnaire was returned without any questions answered. Code 7 designates a questionnaire which had answers for other questions but not for the price question. It has not been unusual for many respondents to return questionnaires only partially completed. However, as these special questionnaires were returned, it was noticed that many were completed except for the price question. Others indicated hesitation in selection of an answer: a box might be checked and crossed out, or a question mark was inscribed in that section of the questionnaire. Therefore, it appeared proper to isolate these reactions from instances in which no questions were answered or the questionnaire was not returned. Interpretation of these reactions is largely speculative. A plausible explanation is that the respondent thought the TSP was worth paying for, but hesitated to specify an amount, for a variety of reasons including organizational purchasing policies.

The coding format is as follows:

Price Response	Code
"nothing"	0
$1	1
$2	2
$3	3
$4	4
$5	5
in excess of $5	6
price question not answered	7
no questions answered	8

General Distribution of Responses

Slightly more than half (51.2%) of the questionnaires were returned. The distribution of answers checked regarding price is as follows:

Code:	0	1	2	3	4	5	6	7	8	Total
Number:	135	79	39	26	2	56	45	81	29	512
Percent:	26.4	15.4	7.6	9.0	0.4	10.9	8.8	15.8	5.7	100.0

The answer indicated most often was "nothing," with 26.4 percent of the 512 returned questionnaires having this entry. Among the dollar prices chosen, the least popular (0.4 percent) was $4. Summation of the proportions of respondents who indicated a willingness to pay anything yields a total of 52.1.

Elimination of the 110 cases in which codes 7 or 8 applied leaves 402 questionnaires on which a price alternative was indicated. The percentage distribution of price choices was:

Code:	0	1	2	3	4	5	6	
Percent:	33.6	19.7	9.7	11.4	0.5	13.9	11.2	100.0

Thus, of those respondents who made a choice, one-third said they would have paid nothing for the TSP. One-fourth (25.1%) would have paid $5 or more, and 41 percent would have paid from $1 to $3. The total proportion who would have paid at all was 66.4 percent.

Price Distribution for Selected TSP's

The previous analysis is useful primarily to provide reference points. Any analysis of demand and pricing should deal with discrete products, in this case TSP's. The optimum approach would examine the alternative prices indicated for each TSP, but the largest sample size in this case was 38. (See Line 2, Total, Table 1.) Therefore, a less satisfactory method was used. TSP's for which at least 10 questionnaires had been returned were selected for analysis. The titles of the Tech Briefs selected for this analysis were:

65-10156 Inorganic Paint is Durable, Fireproof, Easy to Apply

66-10467 Xenon Forms Stable Compound with Fluorine

67-10133 Xenon Fluoride Solutions Effective as Fluorinating Agents

67-10185 Xenon Fluorides Show Potential as Fluorinating Agents

67-10348 Computerized Parts List System Coordinates Engineering Releases, Parts Control, and Manufacturing Planning

67-10361 Pocket-Size Manual Tape Reader Device Aids Computer Tape Checking

67-10440 Fluid Properties Handbooks

67-10610 Handbook of Cryogenic Data in Graphic Form

67-10669 Ultraminiature Manometer-Tipped Cardiac Catheter

The distribution of price codes for these TSP's is presented in Table 1.

Table 1
(Section IV)

Distribution of Price Codes for Nine TSP's

		0	1	2	3	4	5	6	7	8	Total
1.	65-10156	8	2	3	9	1	1	5	3	1	33
2.	66-10467	16	6	2	1	0	2	2	9	0	38
3.	67-10133	12	5	1	1	0	1	1	9	3	33
4.	67-10185	12	5	1	1	0	1	1	9	3	33
5.	67-10348	10	1	0	0	0	6	3	2	1	23
6.	67-10361	3	1	1	2	0	2	0	2	0	11
7.	67-10440	4	0	2	3	0	3	2	2	0	16
8.	67-10610	5	1	3	3	0	3	0	0	0	15
9.	67-10669	2	5	3	1	0	0	0	3	0	14
10.	Totals	72	26	16	21	1	19	14	39	8	216
11.	% of 216	33.3	12.0	7.4	9.7	0.5	8.8	6.5	18.1	3.7	100.0
12.	% of 169	42.6	15.4	9.5	12.4	0.6	11.2	8.3	N.A.	N.A.	100.0

The sample consisted of 216 questionnaires concerning nine TSP's. The variety of subjects with which the nine TSP's deal constitutes a limitation on the meaningfulness of the subsequent analysis. The totals in Table 1 still pertain to a group of TSP's rather than to individual products.

Line 12 indicated that 43 percent of the 169 respondents who selected one of the price alternatives would have paid nothing for their TSP's. This figure is probably a more reliable indicator of unwillingness to pay than was the 33 percent of the 402 questionnaire responses dealt with in the preceding section. Even though the total sample is smaller, the response distribution should be more indicative because it is not derived from a data base which includes a large number of TSP's for which only one request was received. For example, a total of 156 different TSP's were ordered by those who returned questionnaires. Of these, 88 TSP's were requested only once. A single customer's valuation of a product is not a very reliable indicator of the product's value. Yet the aggregated data for the 402 questionnaires are heavily influenced by the 88 single item, single customer valuations. Even a data base of 38 valuations of a product is less than definitive, but within the limits of the data available for analysis the response distribution concerning the nine TSP's is probably the best indicator for pricing decisions.

Table 1 also indicates a wide variety of valuations among the different TSP's, suggesting that TSP pricing decisions should ideally be made on the basis of individual documents. For example, 24 percent of the valuations TSP 65-10156 (Inorganic Paint) were "nothing," while 42 percent were from $1 to $3. Only 18 percent would have paid more than $5. In contrast, TSP 67-10348 (Computerized Parts List System) received 43 percent of its valuations in the "nothing" category, only 4 percent in the $1 to $3 range, but 39 percent in the $5 or more range. While larger samples for each TSP might alter the proportions, the fact remains that each TSP is an individual product and will be valuated differently from other TSP's by users. Ideally, TSP pricing should be individualized by document; this is not an easy option to structure or administer.

Price Choices by Size of Organization

Most TSP requests originate from employees of profit-seeking firms. The TSP's are presumably used for gaining state-of-the-art information, product development, or process improvement, for which the firm is willing to make investments. Therefore, the internal financial situation and policies of various firms might be expected to influence

willingness to pay and the acceptability of different prices. These factors might vary, among other things, with firm size.

Data were tabulated pertaining to the distribution of price choices among organizations of various sizes, and for individuals who did not state a company affiliation.

Both the price code data and organization size data are grouped in Table 2. (A disaggregated tabulation is presented in Appendix B where the problem of small cell size can be seen.) The "individuals" category is not grouped with other data--even though the cell sizes are quite small--because their information requirements and acquisition habits may be different from those of an employee who requests a document through company channels for use in his work. Thus, even though there were only 11 individuals who indicated a price choice, 10 of them were willing to pay something for the TSP they received.

Table 2
(Section IV)

Grouped Data: Price Code Proportions by Organization Size

	Percentages			
	Nothing	$1 - $3	$5 and more	Total
Individuals	9.1	54.5	36.4	100.0 (n=11)
Less Than 500 Employees	35.0	42.7	22.3	100.0 (n=143)
500-5000 Employees	44.2	34.6	21.2	100.0 (n=52)
5000 and More Employees	31.1	40.9	28.0	100.0 (n=193)
Overall	33.6	41.1	25.3	100.0 (n=399)

The 500-1000 employee group appears to have been less willing to pay for TSP's than were the small organizations (under 500 employees) or the larger ones (5000 and more employees). Aside from this deviation from the overall average the data suggest that, in general, about

one-third of the polled respondents, regardless of size of organization in which they work, would not have paid for the requested TSP. About 40 percent would have paid $1 to $3, and slightly more than one-fifth would have paid $5 or more.

Further inferences from this data do not seem warranted. Smaller companies might be expected to prefer lower prices, and larger firms might be expected to pay higher prices, but the differences shown in Table 2 are not so large as to suggest a significant differential price preference among firms of different size.

Influence of Usefulness Ratings on Price Preference

Table 3 presents grouped data pertaining to the relationship between perceived usefulness of TSP's and price preferences. The cell entries are percentages of the total of 427 questionnaires which had both questions answered.

Table 3
(Section IV)

Grouped Data: Price Preferences and Usefulness Ratings

Ratings	Percentages		
	Nothing	$1 - $3	$5 and More
Excellent & Good	14.3	20.9	15.4
Fair & Poor	13.4	14.2	7.3

The price preferences of the 427 respondents who gave a usefulness rating accord with expectations: 36 percent of the respondents rated TSP's excellent or good and were willing to pay for them. Fair or poor ratings were associated with willingness to pay in only 22 percent of the cases. About the same proportions of respondents were unwilling to pay, regardless of the usefulness rating they assigned the TSP. In general, though respondents who were willing to pay were more likely to be those who gave positive usefulness ratings.

Information Evaluation Ratings and Price Preference

Table 4 presents grouped data on price preferences and information evaluation ratings. Only two respondents stated that the information had resulted in a new product or process, and they were excluded from consideration. The "other" category of information evaluation was also excluded, since the category is non-specific. The remaining five alternatives were chosen by 374 respondents, and the Table 4 cells indicate the percentages of the 374 cases which had both the characteristics of the cell.

Table 4
(Section IV)

Grouped Data: Information Evaluation and Price Preference

	Price Preference - Percentages			
Information Evaluation	Nothing	$1 - $3	$5 and More	Total
Information of no value	2.9	0.8	0.5	4.2
Not applicable to my work	4.3	1.3	0.0	5.6
Increased my knowledge of state-of-the-art	13.6	19.0	13.1	45.7
Provided information of limited value to my work	12.3	17.6	8.8	38.7
Provided information of great value to my work	0.5	2.7	2.4	5.6
Total	33.6	41.4	24.8	99.8

As would be expected, the proportion of respondents who thought the information was relatively valueless to their work yet were also willing to pay for it, is quite small. Only 2.6 percent of the 374 respondents were willing to pay for data so evaluated.

Also, 64 percent of the 374 respondents stated a willingness to pay for information which either advanced their knowledge of state-of-the-art, or provided information of limited or great value to their work.

However, even among those who evaluated the information positively (i.e., as in the preceding paragraph), 26 percent stated that they would not have paid for it.

Thus, in this as in other comparisons, there was a substantial number who were unwilling to pay for the requested TSP's, despite their affirmation of its positive value to them.

Several cross-tabulations of TSP price preferences versus other factors are included in Appendix B. These tabulations are presented without interpretation because their economic meaning is obscure. We think TSP users' price preferences are based upon the characteristics of individual documents. Thus, while variation in data pertaining to transfer mechanisms may imply differences among TSP producers, any meaningful interpretation of these differences would require extensive examination of the different "products" of each transfer mechanism. The data for this task are not readily available and it is doubtful that much would be learned if the data were examined. Similarly, price preferences tabulated by subject area are of dubious utility because the subject areas are quite broad and not mutually exclusive.

Conclusions

In general, the aggregate distributions of price preference indicate that at least one-third of the respondents who indicated a preference would not have paid for the requested TSP. About 37-41 percent would have paid from $1 to $3, and 20-27 percent would have paid $5 or more.

Even though more than half the respondents who marked a price choice would have paid something for the TSP, rather large numbers of respondents either stated that they would not have paid, or refused to answer the question. These negative reactions suggest that the whole pricing question should be approached with caution. It is certain that TSP requests as a whole will decline if a price is charged for them. The price mechanism will remove from the market many information users whose interest may be casual. It will also depress demand from more serious users. On the supply side, a functional pricing system would eliminate many TSP's, if they are not acceptable to potential buyers.

Thus a market mechanism could serve the purpose of "rationalizing" the production and distribution of TSP's. The additional problem of possible serendipity under the current system should be dealt with. It could well happen that significant information usage and technology transfers occur quite accidentally because information users have free access to a large variety of TSP's. A "rational" market mechanism might have an adverse impact on such fortuitous events.

It is possible that an important common factor underlying answers that the respondent would have paid nothing for the TSP is a conviction that the information is already paid for by taxes. The TU program is probably interpreted by many people to mean that even a charge to cover reproduction costs would be undesirable. Two respondent comments follow:

> . . . NASA is $ supported by taxes and we would be paying twice for the info.

> For $. 50 could have obtained copy of patent which was support data.

Another respondent, instead of checking an amount he would have paid for the TSP, inserted "our taxes."

There appear to be three basic alternatives related to TSP pricing:

1. Continue the present practice of free distribution. (This is probably the most convenient one.)
2. Charge a standard rate for every TSP. (Demand will be influenced by this approach and consumer dissatisfaction will become evident if the documents are not viewed as worthwhile. More stringent screening standards for Tech Briefs and TSP's would be necessary.)
3. Price TSP's on an individual basis. (This option is the most difficult one to administer. Since there is a wide variation in the perceived value of these supporting materials, it might be worth the effort required.)

A possible approach to individualized TSP pricing would be a detailed examination of each document by a small panel of experts in the field. They could evaluate the document in the context of the current state-of-the-art and assess the contribution made by the new idea. This procedure would provide a reasonable basis, although time consuming, for pricing decisions.

SECTION V

DOCUMENTATION OF TECHNICAL SUPPORT PACKAGE USE

One of the most important areas of DRI's present research effort is the documentation of the use and application of Technical Support Packages. Documentation begins with a screening of returned questionnaires which identifies potential cases for documentation. Screening involves a judgemental decision on the part of two professional staff members derived from reviewing responses to the questionnaire questions either individually or in combination. Once a list has been compiled of those cases showing considerable potential for providing insight into the technology transfer and utilization process, they are then allocated to the Project for the Analysis of Technology Transfer staff for telephone or field investigation.

A more stringent screening process has been in use during the current reporting period than has been applied previously. This approach has produced more significant situations of information use. A sufficient number of documented cases have been developed to permit future analysis for the purpose of improving understanding of incentives and barriers to the transfer process.

The results of our telephone and personal transfer documentation efforts during the report period are presented in Appendix C. They should not be considered as being representative of the universe because of the screening process which disregards statistical sampling techniques. There are 80 cases in Appendix C.

APPENDIX A

INSTRUCTION IN TECHNOLOGY TRANSFER AND UTILIZATION

This appendix presents a course outline and study materials for a program of instruction about technology transfer and utilization. Although the outline is somewhat greater in scope and depth than would normally be developed, it is thought that a detailed outline of this type is justified since it significantly reduces the search effort on the part of persons who desire to teach in this subject area.

This outline was prepared specifically for the Technological Administration course offered by the College of Business Administration within the University of Denver. Also influencing its development was the thought that it might have broader applications. It is recognized that certain modifications should be made in the course outline depending upon the audience involved and the background of the instructor.

The course outline is subdivided into three instructional units. Each part is designed to serve a specific purpose and to successively expand the knowledge base of the student. Ten hours of class time instruction have been outlined.

Part I. Technology Transfer. This unit, as an introduction to the sphere of technology transfer, includes an examination of basic terms, concepts, problems, the nature of the transfer process, producer-user relationships, attitudes, sources, and the acquisition process These ideas and basic insights are necessary for an intelligent understanding by the student. Part I, as outlined, is intended to provide five hours of class instruction.

Part II. Technology Utilization. This unit reflects a deeper examination of utilization problems, government and business responsibilities, and a review of existing programs technology utilization. This unit requires three to four hours of instructional time.

Part III. Case Studies. This unit is intended to use the case study method in the analysis of technology utilization. Its purpose is to give the student an opportunity to examine specific instances of how the process occurred and how potential and products were developed. This unit is intended to provide one to two hours of instruction.

Part IV. Selected Bibliography. A selected bibliography is provided to lend support to the three units of instruction.

The author of this outline is Dr. Walter O. Fischer, Professor, College of Business Administration, University of Denver.

TECHNOLOGY TRANSFER AND UTILIZATION
INSTRUCTIONAL OUTLINE

PART I

TECHNOLOGY TRANSFER

(Instruction - 5 hours)

I. What is Technology Transfer?

A. Introduction
1. Process of Technological Change
a. Science antecedent to invention
b. Invention antecent to innovation
c. Innovation needs social acceptance
2. Definitions
a. Science - An organized body of knowledge and a method of extending or revising that body of knowledge by observation hypothesis formation and experiment (2, pp 1-15) (36) (14, p.1)
b. Invention - The creation of an idea, the process of bringing new technology into being or the new technology created in the process (12, pp 1-18) (32 Brooks pp 21-55)
(1) Rational Process - Essential Properties (A Myth?)
(a) Goal-oriented
(b) Orderly
(c) A process in which it is clear, ahead of time, in which discipline or technology the answer falls
(d) Primarily a matter of applying conscious intelligence to the solution of problems.
(2) Non-rational Process - Essential Properties
(a) Invention frequently works backward from intriguing phenomena rather than forward from well-defined objectives
(b) It is full of unanticipated events - A judging of variables in response to problems and opportunities discovered along the way
(c) Need and technique determine one another: neither is fully determined at the outset
(d) It is not apparent ahead of time from what disciplines and technologies the answers will come

c. Innovation - The process by which an invention, discovery, idea or conceptualization is translated into the economy through use (8, pp 18-38) (15) (25) (30)
   (1) Evolutionary Steps
      (a) Look at one process or idea
      (b) Select one unusual or strong quality or attribute
      (c) Apply that attribute to something else
   (2) Economic Dimension - The establishment of a new economic configuration out of the old, known, existing elements. Innovation is the missing link between having a number of disconnected elements, each marginally effective, and an integrated system of great power. (4, pp 146-149) (15, pp 291-293)

d. Technology - The application of the physical sciences to work. It includes both physical objects and techniques associated with them. (14, pp 9-16) (39, p 5) Another definition is: Technology is here considered to be technical information, including scientific knowledge, making possible the conception, development, design, production, and distribution of goods and services. (33, p 7)
   (1) Outer Aspect - An environment within which we live, made up of external and tangible things which we modify from time to time and which modify us. (11, Diehold pp 2-23)
   (2) Inner Aspect - Consists of skills of body and brain, of technical and administrative procedures, of mental processes - both conscious and unconscious, some associated with value judgments, which relate man's outer moral to his inner one.

e. Diffusion - The acceptance over time of some specific idea, technique, or practice by an adoption unit, group or channel of communication to a social structure and attached to a given structure of values and cultural beliefs. (33,pp 7-14) (41, pp 191-203)
   (1) Acceptance or application of an innovation is required
   (2) Time is a key factor
   (3) The social system with its varying characteristics and problems is an important corollary

f. Transfer of Technology - The acquisition, development and utilization of technological information in a context different from that in which it originated. Thus, innovation must occur--the new and novel application of technology to a perceived need. (37, Mesthene pp 15-25) Another definition is: The term transfer means just that: the effective communication of such information from one person or source to a recipient who accepts it for consideration and possible application. Transfer is particularly concerned with the movement of information from one stage in the developmental process to another, e.g., vertically, from phenomena-oriented research to applied research to development; or horizontally, in movement from one sector of the economy to another. (33, p 7)

B. The Nature of Technological Transfer
   1. Functions Involved (33, pp 9-16)
      a. Initial reporting by generator or producer of new technology
      b. Dissemination of information to potential user
      c. Acquisition by potential user
      d. Evaluation and application of new technology to the economic process
   2. Care of technological information process includes
      a. Cataloging
      b. Indexing
      c. Abstracting
      d. Storage
      e. Retrieval
      f. Reproduction
      g. Translation
      h. Synthesis
      i. Transformation
   3. Availability per se does not constitute the transfer process--recipient must receive, consider and possibly use the information.
   4. Multiple diffusion responsibilities
      a. Reporting and Dissemination - Primarily are a function of the generator or his organization.
      b. Acquisition and Application - Primarily are a function of user or adapter

c. Dissemination and acquisition - Frequently these are functions of auxillary organizations (e.g., Information specialists or transfer agents)

5. Observable patterns of the diffusion process of technology (33, pp 9-16) (37, Bowen pp 4-12) (32, Kimball pp 347-356)

a. Vertical Diffusion - Occurs when one type of technology, phenomena oriented, originates in a basic research environment - proceeds to applied research - and uitimately to development and product.

e.g., Basic Research
↓
Applied Research
↓
Developmental Research
↓
Product

b. Horizontal Diffusion - Occurs when the technology originally appears in a highly sophisticated, high performance system or product - is next applied by manufactureres of materials and components - is then utilized by producers of industrial products and machinery - and is ultimately incorporated into consumer goods.

e.g., Sophisticated High Performance System or Product → Materials and Components → Products and Machinery → Consumer Goods

C. Problems in Technological Transfer (32, Kimball pp 347-356)

1. Human resistance to change.
   a. Psychological barriers to change
   b. Need to alter goal perception
   c. Transmit advantages of new technology to potential user
2. Inadequate skills and viewpoints (33, pp 45-50)
   a. Differing views of information transfer develop differing demands
      (1) Scientist - He confines interests to one or a few narrow specialized areas
         (a) Scope of each specialty is basically confined to the effectiveness of the communication system (21, pp 18-26) (22, pp 21-31)

(b) If communications network becomes too narrow - he narrows his interests to those specialties he can handle, i.e., those through which he can remain informed
(c) Modern science, however, requires greater contact with other disciplines and a broader knowledge base.

(2) Technologist - He must be receptive to ideas from all fields of science and technology.
(a) He cannot restrict his specialty to an information system which he can readily handle
(b) As compared to the scientist he appears to function at the opposite end of the communications system continuum.

(3) Technical Administrator - His information needs overlap those of the scientist and technologist (9, pp 161-168) (20, pp 85-100) (10, pp 112-129)
(a) He must encompass large and varied amounts of technical information
(b) He must know what is being done and by whom
(c) His need to know is directly related to the effectiveness of research and development, re:
1) Continuation of programs
2) Evaluation of programs
3) Modification of programs
4) Termination of programs
5) Development of new programs

(4) Organizational Environment - The sphere within which the skills and viewpoints find expression - the freedoms and constraints
(a) Nature of the industry
1) Traditional (conservative) vs. innovative (progressive)
2) Competitive pressures to change prevailing practices
(b) Nature of the company
1) Specialized vs diversified
2) Revenue production vs. cost reduction
3) Assembler vs. producer
4) Nature of organization library facilities and information acquisition systems (24, pp 4-19)

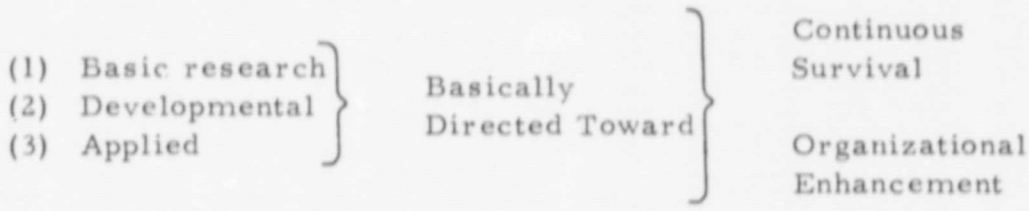
b. Common inadequacies in the information system, i.e., information strategy
   (1) Where to look?
   (2) What is required?
   (3) Why is it needed?
   (4) When is information needed?
   (5) How can it be acquired?
   (6) By whom was it generated?
   (7) What is access?
   (8) To whom should information be channeled?

3. Poor Producer-User Relationships
   a. Information transfer consists of separate or unit operations (13, pp 13-21)
      (1) Barriers between these separate operations
      (2) Capacity limitations of information systems
      (3) Translation problems (13, pp 1-11)
   b. Communication of R & D results (31, pp 110-114)
      (1) Effectiveness is influenced by originator's abilities to:
         (a) Compact findings (abstracting)
         (b) Review findings
         (c) Interpret findings
      (2) Relevance of data classification system - to make knowledge available to potential user
         (a) Scientific community must devise a fundamental system of data classification
            1) Must meet options of originator of knowledge
            2) Must be capable of translation into multiple language systems
         (b) Classification scheme must further meet the requirements of:
            1) Need to know
            2) Avoid redundancy in recording data or its announcement
            3) Save time, energy and conserve resources
            4) Be readily available
   c. Attitudes of potential users (33, pp 27-49)
      (1) General lack of awareness of existing information indexes
      (2) Recognition of the myriad problem solving sources
      (3) Examination of prejudices toward existing information sources

d. Jurisdiction problems of technological data
   (1) Company prerogatives
   (2) Patent environment - freedoms and constraints
      (a) Private
      (b) Government
      (c) Foreign
e. Library acquisitions and cataloging problems
   (1) Journal articles vs. Informal R & D reports
   (2) Current status of government reports
   (3) New cataloging requirements to improve retrieval procedures
   (4) Library technology potentialities, e.g., machine translation (3, Mumford pp 85-92)

D. Scope of Information Inventory (35, pp 9-24)
   1. Time span acceleration
      a. Relationship to economic needs
         (1) National priorities, re: growth
         (2) Speed of economic growth
         (3) Demand for new products and services
         (4) Employment - Unemployment indexes
      b. Geographical Imbalances
         (1) Developing vs. underdeveloped nations
         (2) Regional concentrations
         (3) Community uniqueness
      c. Industry Imbalances
         (1) Concentration among a few
         (2) Ability to compete - available resources
      d. Time lags
   2. Sources of New Technology (35, pp 17-22)
      a. Government - nonprofit orientation
         (1) National Aeronautics and Space Administration (NASA)
         (2) Department of Defense (DOD)
         (3) Atomic Energy Commission (AEC)
         (4) Department of Transportation (DOT)
         (5) Department of Health, Education, and Welfare (HEW)
         (6) Department of Housing and Urban Development (HUD)
         (7) Other

b. Industry - Profit orientation (user focus)



c. Universities
   (1) Sponsored
   (2) Unsponsored
d. Foreign - comparable source, e.g., inventor associations, new product centers, research institutes, universities, private industry, etc.
e. Professional and scientific organizations
f. Other

3. Magnitude of knowledge generation (35, pp 28-34) (38, pp 8-10)
   a. Publications
   b. Patents
   c. Inventions
   d. Research expenditures

E. Why Technology Transfer? (33, pp 2-3) (35, pp 28-33) (41, pp v. -vl)
   1. Historical transfer patterns
   2. Relationship to complex societies
      a. Chance vs. efficient transfer acquisition
      b. Specialization and systematized communication systems
      c. Technological concentrations
      d. Reciprocal knowledge generation
         (1) Basic R & D contributes to applied fields
         (2) Applied fields and value added contributes back to originators of the technology
   3. Value added concepts (36, pp 33-34)
      a. Value related to the speed and breadth of information dissemination
      b. Value increases as information is delivered in terms of user's needs.
         (1) Language compatibiiity
         (2) Specialized interests
         (3) Points of reference
         (4) Personal value systems
         (5) Experience

c. Value is further enhanced as time is reduced in information gathering

F. Acquisition - The Transfer Process (31, p 109) (33, pp 10-11) (32, Kimball p 350) (35, pp 87-101) (43, pp 13-15)

1. Finding the technical information
   a. Documentation
      (1) Patents
      (2) Research reports
      (3) Unanalyzed data
      (4) Handbooks
      (5) Press articles
      (6) Technical journals
      (7) Conference proceedings
      (8) Seminars
      (9) Notebooks of scientists and engineers
      (10) Other forms
   b. Finding requires two conditions
      (1) Capable people are assigned with primary responsibility for acquisition through available channels
      (2) Generators agree to cooperate
2. Screening the information
   a. Special significance and relevance
      (1) Value of one piece of information to another
      (2) Retention and categorization for future retrieval if it lacks current practical value
   b. Cost sharing responsibilities may be borne through
      (1) Purchase of services
      (2) Membership in information services
      (3) Purchase of publications
      (4) Support of professional societies or trade organizations
      (5) Other means, e.g., grants
3. Organizing for retrieval
   a. Indexing by report title is inadequate and frequently inaccurate, re: retrieval
   b. Possible solutions for retrieval
      (1) Hierarchial descriptive methods with cross referencing
      (2) Multiple set systems with reasonable homogeniety of interests and language
      (3) New abstracting concepts
         (a) Mirrors content
         (b) Reduction of logistics and cost to user

c. Attention to significance
d. Improving speed of announcement

4. Cohesion of elements
   a. Relevance of screening by unrelated technological advances
   b. Modification of resource by the addition of new data
   c. Need for switching systems among information systems: compatibility
5. Encouragement of information use
   a. Information is marketable
   b. Market is segmented
   c. Market requirements vary to warrant: market enhancement
      (1) Thoughtful repackaging of information
      (2) Creation of interest profiles of technical data
      (3) More emphasis on interpretation of "why" data information is significant
      (4) "What is means" to potential user
      (5) Improved local access
      (6) Better referral services
      (7) More communicators (other disciplines to compliment scientists and engineers)
      (8) Determination of user problems and objectives
      (9) Analysis of acceptance or rejection of ideas, re: information transfer
6. Data relationship to present and future
   a. Technology transfer implies provision of what now exists
   b. It further implies the indications of what factors are sure to bear upon it in the future
7. "Browsing"
   a. Permits technological knowledge acquisition not directly related to current problems. Maintaining state-of-the-art knowledge
   b. Implies access to central data banks
   c. Information scanning through console facilities
8. Personal involvement of scientist, technologist or administrator
   a. Written word is essential to technology transfer
   b. Insufficient for effective transfer needs
      (1) Person-to-person interplay
      (2) Consensus modeling (2)

9. Organizational Support (Technical Management)
   a. Top management commitments
   b. Possible creation of new organizations structure, e.g., technology agents
   c. Controls

PART II

TECHNOLOGY UTILIZATION

(Instruction - 3-4 hours)

II. Technology Utilization

A. Additional Barriers to Technology Utilization

1. Data base
   a. Size, e.g. 60,000,000 pages of literature annually
   b. Complexity - diversity of knowledge generation
   c. Relevance - recognizeable utility to user
2. Problems due to organizational orientation
   a. Government contractors - Isolated from commercial markets. Must identify direct, tangible items of commercial interest. If yes, organization can:
      (1) Establish commercial subsidiary or division
      (2) Diversify through merger or acquisition
      (3) Expand patent, planning or marketing functions
   b. Firms serving commercial market - relatively isolated from new technologies. If interested, can:
      (1) Seek government contracts
      (2) Upgrade literature research skills
      (3) Acquire or merge with companies doing government work
      (4) Hire personnel familiar with experience in fields related to company's commercial activities
   c. Firms serving both commercial and government markets. May not optimize opportunities to utilize new technologies. If interested in greater exploitation of potential, may:
      (1) Reallocate scientific-engineering resource from government contracts to commercial applications
      (2) Acquire new scientific-engineering personnel
      (3) Achieve some organization compromise between isolation and too much integration
      (4) Minimize differences between commercial and government administrative procedures
3. Other Common Problems
   a. "Not invented here" (NIH) attitude
      (1) Rejects externally developed information
      (2) Creates internal dissention, re: generator of idea

b. Government patent policies
   (1) No uniform policy covering ownership of patents arising from government sponsored R & D
   (2) DOD and NASA represent different points of view
   (3) Patents freely available to all potential users creates little incentive for inventing company or others
c. Invention disclosures and patent reporting
   (1) Results in unreported inventions
   (2) Many "idle" inventions exist which have commercial value
   (3) Company attitudes toward patent personnel requires:
      (a) Relationship to total organization
      (b) The authority to cross departmental barriers
d. Time and interest limitations
   (1) Over concentration on specialization
   (2) Urgency of crash schedules
   (3) Focus on scientific objectives
   (4) Cost vs. anticipated benefit
e. Institutional constraints
   (1) Organizational policy
      (a) Company attitudes
      (b) Union attitudes
   (2) Outmoded codes, etc.
      (a) Building and Housing
      (b) Transportation
      (c) Government and corporate charters

B. Government and Business Responsibilities for Technology Utilization
   1. Government
      a. Degree to which it should accept responsibility for stimulating economic growth
         (1) In what ways?
         (2) Through what programs?
         (3) How much control should it retain?
         (4) Should efforts be short or long range?
      b. Government's role in development of national resources
         (1) Corollary to programs of natural resources development

(2) Relationship to regional and national economic health and growth

c. Regional imbalances
   (1) Transfer programs could offset existing inequities
   (2) Stimulate regional growth where warranted

d. Technology transfer could favor marginal producer
   (1) Indirect subsidy
   (2) Perpetuate inefficient practices
   (3) Loss of effectiveness if innovative enterprise is not encouraged

e. Historic promulgation of scientific activity, technological inquiry and production
   (1) Currently generator of new knowledge and technology
   (2) Use of new technology is considered to be wholly or partially in public sphere
   (3) Has obligation to insure optimum return on public investment in research and development
   (4) Has responsibility to prevent scientific-technical redundancy and contradictions

2. Industry Responsibilities
   a. Only limited effort to manage technology acquisition
      (1) Need to develop controls to measure costs of technology transfer
      (2) Financial control aids in the proper management of human and physical resources
      (3) Area requires increased managerial attention
   b. Continuing education for scientific-technical personnel
   c. Publishing industry obligations
      (1) Searching
      (2) Monitoring
      (3) Evaluating
      (4) Distributing

      } Technological Information
   d. Contribute to evolution of new transfer systems or media

3. Existing media utilized (33, pp. 24-27) (35, pp. 48-50)
   a. Supplier - vendor personnel
      (1) Have ability to understand and discuss technical problems
      (2) Ability to suggest possible solutions
      (3) Readily available for discussion
      (4) Ability to provide quick answers about products and materials

(5) Are sources of information on new products, materials and services

b. Supplier - vendor catalogs
   (1) Provide very specific technical information
   (2) Ready references
   (3) Give opportunity for comparisons if competing product/service lines
   (4) Provide leads for further exploration

c. University and other consultants
   (1) Solve or investigate specific problems
   (2) Idea stimulators through dialogues with scientific-engineering personnel

d. Conferences, conventions, symposia, etc.
   (1) Opportunity for informal discussion
   (2) Provide direct questioning of researchers making formal presentations
   (3) Can concentrate on particular interest fields

e. Trade publications
   (1) Valued for technical articles which are practically oriented
   (2) Provide general news about industry and subjects being explored
   (3) Give information about new products

f. Professional journals
   (1) Oriented toward specialized disciplines
   (2) Provide forum for fundamental and state-of-the-art endeavors
   (3) Many utilize strict screening and review requirements (saves time)

g. Textbooks and handbooks
   (1) Important source for problem solving
   (2) Important in less sophisticated areas of education, e.g. vocational-technical
   (3) Tend to be two to five years behind state-of-the-art

h. Government publications
   (1) Variety and volume overwhelm people
   (2) Many researchers unfamiliar with useful publication sources
   (3) Too difficult to retrieve relevant information
   (4) Disinterest if not involved in government R & D contracts

i. Abstract and index services
   (1) Primary source of search clues
   (2) Tend to be one year behind state-of-the-art
   (3) Frequently too shallow and of poor quality
   (4) Some abstracts are good, e.g., Chemical Abstracts

j. Information dissemination centers
   (1) Store vast amounts of information
   (2) Provide special services
      (a) Bibliographies
      (b) Retrospective literature searches
      (c) Reprints
      (d) Technical consultation
   (3) Currently, not widely used

k. Educational Programs
   (1) Provide new competence
   (2) Not - new technology or innovative ideas

l. Patent literature
   (1) Provides specific and detailed technical information
   (2) Gives survey of current state-of-the-art

m. Person-to-Person

C. Existing Programs for Technology Utilization
   1. Purposes
      a. Increase return of the national investment in aerospace research and development by encouraging use of the knowledge gained
      b. Shorten the time gap between discovery of new knowledge and its effective use in the market place
      c. Aid the movement of new knowledge across industry, disciplinary and regional boundaries
      d. Contribute to the knowledge of better means of transferring new knowledge from its points of origin to its points of potential use
   2. Programs (38) (34) (35 pp. 55-73) (40)
      a. Science Information Exchange (Smithsonian Institution)
         (1) Inventory of current and ongoing research
         (2) Identifies who is working in the field
         (3) What investigators are doing
         (4) Notice of research report includes:
            (a) Name of supporting agency
            (b) Specific title of project

(c) Names, departments, official titles of personnel engaged on the project
(d) Name and address of institution doing project
(e) 200 word summary of project
(f) Specific location
(g) Beginning and anticipated conclusion dates
(h) Annual dollar effort

(5) Delimitations

b. Offices of Industrial Cooperation - AEC

(1) Functions
(a) Actively search and disseminate information to industrial organizations
(b) Be aware of needs of particular segments of industry
(c) Encourage industrial participation program
(d) Arrange industrial consultations and visits
(e) Work with local organization suitable to its general purposes

(2) Activities
(a) DTI Services (Division of Technical Services)
1) Quarterly Technical Progress Reports
2) Nuclear Service Abstracts (Quarterly)
3) Publication of books and monographs
4) Management of Engineering Materials program
5) Management of AEC's publication distribution network
6) Coordination with other government agencies
(b) Topical reports - published by contractors (annual reviews of program status)
(c) Technical journals - papers. Encouragement to publish unclassified findings
(d) Trade journals - AEC funded technology appears in nuclear journals
(e) Seminars and information meetings
(f) Information centers
1) Twelve specialized centers
2) Each very specific - very narrow range
3) Complete repository of information in each field

(g) Consultation Services
1) Information
2) Technical problem solution
(h) Access permit programs - provide classified information to individuals or companies engaged in civilian use of atomic energy

c. NASA Technology Utilization Program
(1) Scientific and Technical Aerospace Reports (semimonthly) (STAR)
(a) Arranged by subject categories
(b) Two digit permanent identification numbers
(c) Accession number identifies document at which time it is accepted into NASA information system
(d) Indexes include:
1) Subject
2) Corporate source
3) Personal author
4) Report number
5) Accession number
(2) International Aerospace Abstracts (IAA)
(a) Promotes world wide coverage of
1) Scientific journals also trade
2) Books
3) Meeting papers
(3) NASA - scientific and technical publications
(a) Technical reports - final report of a complete NASA research project
(b) Technical notes - present reports of completed segments of continuing research projects
(c) Technical memorandums - unconfirmed or preliminary data, classified information, proprietary information, or information of limited interest
(d) Contractor's reports - Reflect scientific and technical information generated under a contract or research grant
(e) Technical translations - Verbal translations of foreign language research documents considered to be worthy of such translation

(f) Tech briefs - are two page briefs describing
1) Innovations
2) Inventions
3) Devices
4) Discoveries
5) Concepts

(g) Technology surveys - comprehensive guide-books to highlight state-of-the-art fields in which NASA has made significant contributions

(h) Continuing bibliographies - annotated bibliographies in technical areas related to space programs

(i) AEC-NASA Tech Briefs - joint reporting of common contributions - e.g., (f. above)

(j) Reliability abstracts and technical reviews - highly specialized directed to experts in product and program reliability

d. NASA - services (33, pp. 70-77)

(1) Regional Dissemination Centers

(2) Information search and retrieval for industrial contractors

(3) Technological information utilization service

(4) Consultation and processing of inquiries re: utilization

(5) Licensing of NASA owned patents

(6) Sponsorship of Biomedical Application Teams

(7) Dissemination of computer programs developed for or by NASA

(8) Distribution of selected foreign documents

(9) Cooperative programs with other agencies

(a) Vocational Rehabilitation Administration

(b) Small Business Administration

(c) Office of Law Enforcement Assistance

(d) Bureau of Public Roads

(e) Office of State Technical Services

(f) Clearing House for Federal Scientific and Technical Information

(g) Other

(10) Special Activities

e. Defense Documentation Center (DOD)

(1) Primary user - Defense Contractors

(2) Shifting to Non-Defense oriented firms
  (a) Relaxing of Security Considerations
  (b) External pressures for wider access

f. Other Agencies
  (1) Small Business Administration
  (2) Office of State Technical Services
  (3) Institute for Applied Technology
  (4) National Science Foundation
  (5) Agency for International Development
  (6) Other

g. Future Role of Government
  (1) Responsibilities and Programs of Newer Agencies (DOT)
  (2) Pressures for Change (DOD)
  (3) Inter-disciplinary trends
  (4) Federal Council for Science and Technology
  (5) Private enterprise functions compared with government.

PART III

CASES IN TECHNOLOGY TRANSFER

(Instruction - 1-2 hours)

III. Case Studies

A. Student - Instructor Orientation - Experience suggests that students can materially improve their understanding of technology transfer and utilization processes when they are provided with specific illustrations of this phenomenon. The manner in which case studies are utilized should in large measure be governed by the education, experience and purposes of the instructor. To provide the widest possible latitude in the selection of appropriate case materials no specific illustrations are recommended. However, to minimize the burden of search the following publications are suggested as source documents for appropriate case histories.

B. Publications

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PART IV

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APPENDIX B

TECHNICAL SUPPORT PACKAGE PRICING

The three tables included in this appendix provide data related to the discussion of TSP pricing in Section IV. The information is presented here because its economic meaning is limited, yet may be of interest to some readers (Tables 1 and 2), or to illustrate the problem of small cell size which occurs with disaggregation (Table 3).

Table 1

Numerical Distribution of Price Choices by Transfer Mechanism

Transfer Mechanism	Nothing	$1	$2	$3	$4	$5	In Excess of $5	Price Question Not Answered	No Questions Answered	Totals
Ames Research Center	7	10	6	2	1	5	0	6	2	39
Argonne National Laboratory	44	16	4	4	0	6	5	27	7	113
Goddard Space Flight Center	17	14	7	15	1	4	10	11	4	83
NASA Headquarters	1	0	0	0	0	0	0	0	0	1
Kennedy Space Center	15	4	7	6	0	8	3	5	1	49
Langley Research Center	0	1	0	0	0	0	0	0	0	1
Manned Spacecraft Center	13	11	1	5	0	3	5	7	3	48
Marshall Space Flight Center	15	21	11	11	0	21	16	20	8	123
Space Nuclear Propulsion Office	13	1	0	2	0	6	3	2	1	28
Jet Propulsion Laboratory	9	1	3	1	0	3	3	3	3	26
TOTALS	134	79	39	46	2	56	45	81	29	511

Table 2

Numerical Distribution of Price Choices by Subject Area

Subject Area	Nothing	$1	$2	$3	$4	$5	In Excess of $5	Price Question Not Answered	No Questions Answered	Totals
Electrical	45	35	13	14	1	17	14	31	12	182
Physical Science (Energy Sources)	7	4	5	6	0	6	3	2	1	34
Materials (Chemistry)	59	31	13	21	1	14	18	41	12	210
Life Sciences	1	0	1	0	0	2	1	0	0	5
Mechanical	9	5	4	4	0	9	5	4	2	42
Computer Programs	13	4	3	1	0	8	4	3	2	38
TOTALS	134	79	39	46	2	56	45	81	29	511

Table 3

Numerical Distribution of Price Choices by Organization Size

Size (Number of Employees)	Nothing	$1	$2	$3	$4	$5	In Excess of $5	Price Question Not Answered	No Questions Answered	Totals
Unknown	42	30	11	5	0	14	4	33	4	143
1-10	1	4	1	1	0	1	3	0	2	13
11-50	0	0	0	0	0	0	1	0	0	1
51-100	0	0	1	2	0	1	1	0	0	5
101-500	8	2	1	9	0	2	9	4	4	39
501-1,000	2	4	1	0	0	2	2	1	1	13
1,001-5,000	21	6	4	3	0	6	1	0	1	42
5,001-10,000	5	9	3	11	1	2	3	2	2	38
10,001 and more	55	24	17	15	1	28	21	41	15	217
TOTALS	134	79	39	46	2	56	45	81	29	511

APPENDIX C

CASES CONCERNING THE USE OF TECHNICAL SUPPORT PACKAGES

The purpose of this appendix is to:

1. document the results of our telephone and personal follow-up effort initiated by questionnaire responses;

2. create a broader data base for analysis of factors that influence technological transfer;

3. prepare for future analysis leading to recommendations for improvement in dissemination practices.

Case Number: 80200692

The Colorado Department of Highways intends to test inorganic paint formulations developed by Dr. J. B. Schutt of Goddard Space Flight Center for a variety of highway applications.

Subject	Technology Source
State of Colorado Department of Highways Materials Division 4201 E. Arkansas Ave. Denver, Colorado 80222 303-757-9248 Contact: J. J. Gretter Chief Chemist	Goddard Space Flight Center Tech Brief: 65-10156

The laboratory staff of the Materials Division, Colorado Department of Highways will soon initiate an experimental program to develop specifications for an inorganic paint system for a variety of highway applications. J. J. Gretter, Chief Chemist, has spent about 16 hours reviewing the NASA Technical Support Package which will be the primary information input to the program.

Among the contemplated uses of an inorganic system are traffic striping, aluminum sign coatings, and a ceiling coating for the 1.7 mile-long Straight Creek Tunnel.

Traffic striping applications might eliminate many of the problems associated with organic paints. Organic paints do not adhere well to Portland concrete, and frequent repainting is required as the stripes separate from the concrete in large flakes. An inorganic system that could provide a molecular bond with the concrete would enhance the durability of striping, thereby decreasing maintenance costs. (A secondary, but quite important, benefit would be a reduction of exposure of highway crews to hazardous traffic conditions. The Department's efforts to find a more durable striping material received great impetus when an employee was recently killed during a striping operation on Interstate Highway 25.)

A new method of applying striping materials may enhance the use of an inorganic paint. The method involves pre-heating of the paint and spraying it on while hot, thus minimizing drying time.

Case Number: 80200692 (Cont.)

Successful adaptation of an inorganic system could also solve problems associated with aluminum highway signs and markers. Organic paint does not adhere well to aluminum, and an inorganic paint with improved adhesion would be quite valuable.

Finally, the inorganic paint will be tested for use as a ceiling coating for the Straight Creek Tunnel. Vitreous tile is commonly used in highway tunnels, but Straight Creek is so large that the cost of using tile would be excessive. Several alternatives are being considered, including an epoxy-base coating. However, it is anticipated that the temperature in the tunnel (a constant 40-45 degrees F) may inhibit proper curing of an epoxy coating.

An inorganic paint with good adhesion and reflectivity would be among the most desirable alternatives, especially because of its fireproof qualities. No fire hazard is allowable in such a tunnel, whether in the form of a tendency to flame or merely to char and create toxious fumes.

Mr. Gretter noted during the personal interview that inorganic systems are of great interest to many state highway departments. For example, California recently specified inorganic paints for all outdoor structural metal primers.

Monetary costs and benefits are not readily estimable at this time. Mr. Gretter speculated that it might cost $15,000 to generate in his own laboratory the information in the NASA package. However, he would not find it necessary to produce such an exhaustive treatment of the subject. Therefore, savings will be considerably less than $15,000. Costs incurred to date comprise 16 hours spent by Mr. Gretter for review of the NASA document. He anticipates that about two man-months will be required for laboratory work and two man-months for field tests.

Mr. Gretter has used only one Tech Brief, but he also acquired SP 5014 (NASA Contributions to the Technology of Inorganic Coatings) and another special publication which deals with inorganic paint research. He became aware of Tech Brief 65-10156 by reading an article in Business Week. He ordered the material as a matter of general interest in keeping up-to-date with innovations in his field, but also with the intention of evaluating the system for the applications previously discussed. He knew of no other sources which would have definitive information on the

Case Number: 80200692 (Cont.)

subject, but if he had had to turn to likely sources, he would have first questioned coatings manufacturers. Materials suppliers might be approached, but were considered less likely to be helpful. He also mentioned that the Paint Research Institute sponsored by the Federation of Societies for Paint Technology might be a good source.

WH:bg
8/8/68

Case Number: 80201070

A major manufacturer of signal devices is testing a solid state fuse in one of its product lines.

Subject	Technology Source
Major signal device manufacturer	Goddard Space Flight Center
	Tech Brief: 66-10691

E. F. Thomas, Jr., of the Goddard Space Flight Center, developed a conductive-epoxy fuse which protects electronic circuits from overloads and recovers its conductivity when the overload is removed. The R & D staff of a major manufacturer of signal devices is conducting tests related to adaptation of the device. Several fuses have been built and appear to work quite well in the company's products. Testing is planned for one year, during which accelerated and extreme procedures will be used. If testing is successful, the fuse will become a standard component in the product line with a required twenty-five year service-free life.

Several other applications are being considered for the device. The nature of the company's products is such that standard fuses are not very practical. Therefore, this fuse might substitute for traditional components.

R & D personnel were experimenting with a similar device when they became aware of the NASA innovation from an advertisement in Design News. They ". . . decided not to re-invent the wheel . . ." and took advantage of the NASA information. It saved about six months' experimentation time. Costs of adapting and testing the innovation might be $1,500 by the end of the testing period.

Although the Tech Brief notes that no action is contemplated by NASA, the principal investigator turned over to company attorneys all material relating to the innovation in order to assure the legality of their use of the device.

During the project, several outside sources, including epoxy manufacturers, have been consulted. No one was found who was aware of any information about this type of device. The NASA information was viewed as a unique source for this company.

Case Number: 80201070 (Cont.)

Product engineering and R & D personnel in the Materials Testing Laboratories are regular users of Tech Briefs, but a well-organized dissemination system does not exist in the company. A company engineer commented "If you didn't know that they're here, you'd never find them."

WH:bg
8/7/68

Case Number: 802001315

U.S. Gypsum Company will utilize a method developed by the Lewis Research Center to monitor the quality of its wallboard products during the manufacturing process.

Subject	Technology Source
U.S. Gypsum Company 500 Quarantine Road Baltimore, Maryland 21226 301-355-6600 Contact: Mr. J. K. Williams Quality Superintendent	Lewis Research Center Tech Brief: 67-10286

U.S. Gypsum Company plans to use liquid crystals to help control the quality of its gypsum wallboard.

Gypsum wallboard consists of a layer of gypsum, in which voids have been created, between two layers of paper. The strength and consistency of the wallboard is, to a large extent, dependent on the size and distribution of the voids within the gypsum.

Prior to this time, there has been no satisfactory method for non-destructively determining the distribution of voids within wallboard. As an aid to quality control and as a determinant for needed changes in manufacturing techniques, U.S. Gypsum Company plans to use liquid crystals, on a sampling basis, to determine the size and distribution of voids within its wallboard. These crystals, when applied to a surface and heated, show temperature differentials, and thus voids, by a change in color. U.S. Gypsum sees this as a method for insuring the quality and consistency of its wallboard product.

The original NASA use of this technology was as a determinant for voids in fiberglas laminates. This use is a direct transfer of NASA technology.

ROM:dk
4/30/68

Case Number: 80201318

The Bell Helicopter Company of Fort Worth, Texas is evaluating a NASA developed technique utilizing liquid crystals as a quality control method for bonded panels.

Subject	Technology Source
Bell Helicopter Company P. O. Box 482 Fort Worth, Texas 76101 817-282-7111 Contact: J. H. Powell Engineer, Methods and Materials Research Laboratory	Lewis Research Center Tech Brief: 67-10286

Bell Helicopter's Methods and Materials Laboratory has been assigned the specific task of comparing methods for the testing of bonded panels and choosing a method for production use based on these comparisons.

Triggered principally by NASA work in this area, Bell has chosen the liquid crystal method of testing for voids as one of the test processes to be examined. Two other methods under examination include a laser interferometer technique and an infrared technique.

Development of one of these techniques is expected to yield an improved method for testing the integrity of bonded panels. The present method is mechanical and is subjective in nature. The bonded panels referred to include both honeycomb and other types and are used extensively in Bell Helicopter's helicopter models.

Mr. Powell stated that Bell has expended approximately 20 to 30 man-hours of effort and several hundred dollars worth of materials testing the liquid crystal technique. Development and testing continue, and the final choice of test technique will probably not be made for approximately another six months.

Bell's technical library is a regular recipient of NASA Tech Briefs and other NASA literature, and the librarian routes information which he thinks will be of interest to members of the engineering group at Bell.

ROM:dk
6/2/68

Case Number: 80201569

The Burroughs Corporation plant in Plymouth, Michigan, is using a reference document developed by RECON, Inc. for NASA, dealing with evaluation of arc suppression techniques.

Subject	Technology Source
Burroughs Corporation 41100 Plymouth Road Plymouth, Michigan 48170 313-433-1400 Contact: Jack Beery	Marshall Space Flight Center Tech Brief: 66-10449

Mr. Jack Beery of the Burroughs Corporation is using a NASA Technical Support Package (TSP) for evaluating alternative arc suppression techniques. The problem to which the information is addressed is that of interference in adjacent circuitry caused by switching of inductively loaded circuits. Several techniques for suppressing this interference are known generally, but selection of the optimum technique is complex, and costly if done by trial and error. The NASA information provides a tabular presentation of relevant characteristics of alternative suppression techniques, which facilitates selection of optimum circuits and components.

Mr. Berry stated that the document ". . . allowed me to make a correct decision when any incorrect evaluation was being suggested . . . . This information is very solid and showed results that I would not have expected . . . ." He was seeking the most effective suppression technique for a 60 volt coil in a high-speed printer, and found that a capacitor circuit had the most desirable characteristics. The document has been read by many other research and development personnel in the company, and now has the status of an extensively used reference source.

Initial awareness of the document derived from an announcement in Machine Design. Mr. Beery was faced with a well-defined problem and ordered the NASA material in order to solve the problem. No source of comparable information was known to him, and he regards NASA publications as the only reliable source for state-of-the-art knowledge in his field. He thought that other publications were of limited value because of competitive constraints.

Case Number: 80201569 (Cont.)

Costs of using the information are not estimable because of the document's reference nature. However, Mr. Beery observed that "This package allowed me to receive information that product wise I could not afford to generate." He estimated that it might have cost him $50,000 to generate the information himself, but cautioned that this was strictly a guess.

Mr. Beery and other R & D personnel have used a variety of TSP's. His general evaluation was, "As one who also writes reports, I must say that they are well done."

WH:bg
8/6/68

Case Number: 80201753

The Manufacturing Research and Processes Section of Republic Aviation (a division of Fairchild Hiller) is attempting to perfect a technique for degreasing titanium for SST use.

Subject	Technology Source
Fairchild Hiller Republic Aviation Division Farmingdale, Long Island New York 11735 416-531-2234 Contact: John J. Savarese Senior Engineer Manufacturing Research and Processes	Lewis Research Center Tech Brief: 67-10147

Engineers at General Dynamics/Convair originated a Tech Brief describing methods to reduce titanium stress corrosion. Conventional cleaning agents have been found to induce stress corrosion of titanium, especially at high temperatures, due to the reactivity of titanium. The causative processes are not well understood, but trial and error experiments indicated that certain agents should not be used, and that other agents must be diluted. The original Tech Brief issued to deal with this problem was revised after four months due to new findings.

Mr. John Savarese of Republic Aviation is engaged in manufacturing processes which involve titanium. Because of the inescapable problems associated with the reactivity of titanium, he found it necessary to improve the cleaning and handling procedures used at Republic. He had previously worked with titanium during prior employment with Grumman, and was familiar with the problems. He ordered the Tech Brief in its unrevised form but experienced few difficulties that might have been anticipated because of the inadequacy of the original Tech Brief. His experience at Grumman provided the margin of difference.

Republic is now experimenting to find an optimum cleaning technique, which will be used daily when perfected. Application will be in the development program for the Supersonic Transport (SST), for which Republic is a subcontractor. The company also is involved in a subcontract with Grumman, and uses the degreasing procedures for titanium handling and processing for Grumman Aircraft.

Case Number: 80201753 (Cont.)

Despite Mr. Savarese's acquaintance with the subject he discovered some unique information in the Tech Brief. He was unable to specify the magnitude of the savings in development cost from use of the Tech Brief. However, Republic has expended over 100 manhours in the effort to apply the information.

Because titanium cleaning problems are encountered in almost all stages of processing, much attention has been devoted to development of cleaning techniques. Mr. Savarese cited the Battelle Memorial Institute, other aerospace firms, and STAR as alternate sources of information. Some of this information is published, but much of it consists of in-house studies.

Mr. Savarese is a regular subscriber to Tech Briefs. He reproduces those which appear to have wide application and circulates them among his colleagues. The company library also receives them. Primary users of the documents are personnel in research and development, and in manufacturing research and processes.

Mr. Savarese commented that the Tech Briefs are "useful" and that he would " . . . be very disappointed . . ." if he didn't receive his copies.

WH:bg
9/4/68

Case Number: 80201876

D. K. Aerospace, a subsidiary of MSL Industries, has used the "Workmanship Standards Manual for Welding" to improve its production processes. The document was prepared by M. D. Phillips of Aerojet General.

Subject

D. K. Aerospace
5059 South Kedzie Avenue
Chicago, Illinois 60632
313-879-5400
Contact: C. O. Swanson
Plant Manager

Technology Source

AEC-NASA Space Nuclear
Propulsion Office

Tech Brief: 67-10200

C. O. Swanson, D. K. Aerospace's plant manager is a regular recipient of TechBriefs. He reviews them and distributes the most applicable Briefs to personnel within his organization who might have use for them. He said, "We get a lot of use from these Briefs, but, of course, many of them don't fit our operation." He added that a recent Brief on a new method to clean aluminum appeared to have potential for improving another portion of the manufacturing operation.

The Workmanship Standards Manual for Welding was developed and published as part of a standard operating procedure for fusion welding within the NERVA Test Operations, Jackass Flats, Nevada, in October 1966. D. K. Aerospace has been using the document for over one year in its Illinois operation. The welding engineer has applied it in setting up criteria for welding standards. Its main use has been for standards related to the bellows and ducting prepared under Boeing subcontract. Mr. Swanson reported "We use it like a handbook."

It was stated that there were probably both tangible and intangible benefits arising from the use of this manual. Over 100 hours have been expended in reviewing, studying and applying the information. Mr. Swanson thought that there were some savings in time and money, although specific amounts were difficult to estimate. He reported that there were no additional costs incurred in the use of this manual. However, if the manual had not been available, costs would have been incurred in searching alternative information sources.

Case Number: 80201876 (Cont.)

When asked if there were any approaches that might improve the Tech Brief program, no suggestions were offered.

TDB:bp
9/26/68

Case Number: 80302395

A major manufacturer of electronic systems which is a major military and space contractor, is using NASA information about inorganic paints in an attempt to develop a coating for a reentry vehicle.

Subject	Technology Source
A major electronics manufacturer	Goddard Space Flight Center
	Tech Brief: 65-10156

An engineer employed by a major manufacturer of electronic systems and space equipment ordered the NASA Technical Support Package dealing with inorganic paints in order to simplify the company's development of a coating for a new reentry vehicle. The desired coating should have low absorption and high emissivity for thermal control. Certain portions of the vehicle are to be coated with a white radiation-resistant coating.

The engineer completed the Project for Analysis of Technology Transfer questionnaire, including the following comments: "It comprises practical criteria for utilization of other NASA-supported work on inorganic thermal control coatings." "The Tech Brief was most useful for initiation of specific application trials by nonspecialist personnel." The company has expended about 750 manhours in the project.

When contacted by phone, this engineer was quite reluctant to go into further detail. He also was quite suspicious and reticent. He repeatedly stated that it was not the sort of thing that could be properly dealt with over the phone, and finally culminated his refusal to give details by referring me to another man in another division. He stated that he had not worked on this project for six months, and although he had initiated the information request and worked on the project for over a year he did not want to discuss his work in connection with the innovation. His last comment was that he had experienced great difficulty in getting information from other companies (e.g., Douglas, Hughes) who are working on similar problems--evidently indicating the source of his reluctance to communicate.

WH:cp
8/12/68

Case Number: 80302436

Mr. B. Pinsker, Downey, California, is adapting NASA developed inorganic paint formulations for use as a commercial product.

Subject	Technology Source
Mr. B. Pinsker 9230 Ratliffe, Apt. 6 Downey, California 90242 213-923-9516	Goddard Space Flight Center Tech Brief: 65-10156

Mr. B. Pinsker has been conducting what he calls "kitchen sink chemistry" experiments for about three years. During this time he has been trying to develop an inorganic coating system. In November 1966 he requested information from NASA about silicate paints and received the Technical Support Package developed by J. B. Schutt at Goddard Space Flight Center.

The information provided a "breakthrough" for him with respect to the key problem he had encountered. He had been using ingredients identical to those used by Dr. Schutt, but had not achieved the proper mixing technique. The NASA information specified the proper timing for blending-in different ingredients and enabled Pinsker to combine his materials in a usable mixture. He is confident that he will have a marketable product quite soon, since he plans to conduct final experiments in a commercial laboratory next week.

Mr. Pinsker observed that the formulations in the Technical Support Package are very broad and susceptible to many different applications. He was especially impressed with the methodology for "concocting the formulations" and with the generality of the formulations which facilitates empirical mixing of ingredients.

A well-defined need motivated Mr. Pinsker's request for this information. He commented that his experiments were easy to initiate and conduct at home because the raw materials are quite common, readily available, nontoxic, and nonexplosive. The peculiar problems of compounding these materials seemed insurmountable, however. He had discussed these problems with several highly respected Ph. D. -level chemists who universally discouraged him with the comment, "Chemistry is chemistry, and there are some things you can do and some things you can't do. This is one thing you can't do." Mr. Pinsker

Case Number: 80302436 (Cont.)

is not a chemist so he continued his experiments. The Schutt document than provided a means to overcome the only significant obstacle that remained.

Mr. Pinsker has used only this NASA document. He commented that it has been the only one that aroused his interest, and suggested that the Tech Briefs could be improved by altering the title format. In his opinion, the present title format ". . . does not arouse latent interest because the titles are misleading or not sufficiently descriptive."

WH:cp
8/20/68

Case Number: 80403480

Honeywell, Incorporated, St. Petersburg, Florida, had built a rotational hysteresis torque meter to simulate motor operation and to determine the performance of motor rotor rings. M. Cole of Metals Research Ltd. developed the innovation.

Subject	Technology Source
Honeywell, Incorporated 13350 U. S. Highway 19 St. Petersburg, Florida 33733 813-531-4611 Contact: J. W. Luebbe Principal Material and Process Engineer	Marshall Space Flight Center Tech Brief: 67-10412

Honeywell's St. Petersburg facility has 4,000 employees. Its activities are primarily in support of various missile and space programs including Centeur, Poisedin and Minuteman. This division of Honeywell makes gyros and other inertia guidance equipment. As a part of its central efforts, it is necessary to design large numbers of motors which are used, among other things, to drive gyroscopes.

The rotational hysteresis torque meter simulates motor operation in a low cost and simplified way, and therefore, makes it easier to determine the performance of the various materials used in motor rotor rings. The torque meter is an experimental device aimed primarily at developing data. Honeywell has used the basic design described in the Tech Brief, modified it slightly, and built one to assist it in motor design. The cost of constructing the meter is somewhere between $500 and $1,000. The value of the meter is difficult to determine precisely. Mr. Luebbe noted that the product of the meter is information, and that it is difficult to place a value on this information. He noted that the organization has had trouble with the materials in motor rotor rings meeting specifications under actual conditions, and that the meter has been useful in better defining the specs on materials.

Luebbe's reaction to the Tech Brief was generally favorable. He thought when he undertook to design and build the torque meter that it would be a pretty straightforward task. However, he ran into

Case Number: 80403480 (Cont.)

problems. For example, a mirror in the meter oscillates and is hard to read. He noted that the Tech Brief and supporting material made no mention of the oscillation problem.

DCC:bg
9/11/68

Case Number: 80203549

The Scott Paper Company is attempting to develop a fluidic oscillator for the purposes of measuring humidity in its paper drying processes. A Lewis employee, P. R. Proyopius, is the inventor.

Subject	Technology Source
Scott Paper Company Philadelphia, Pennsylvania 19113 215-SA4-2000 Contact: W. A. Spraker Chief Research Engineer	Lewis Research Center Tech Brief: 67-10063

The Scott Paper Company is currently experimenting with a fluidic oscillator which it hopes can measure the moisture under hoods in the paper making process. If information can be developed on the moisture content of the air under the hoods, which has been heated to 900 degrees F, it will be possible to better control the input of heated air and thus realize substantial savings in fuel costs. The magnitude of these savings, according to W. A. Spraker, could run into many tens of thousands of dollars. The company has forty hoods and, of course, if the instrument were developed, other paper companies would probably want to use it.

Spraker said that Scott is not in the instrument development business. He went on to say, "If someone walked in the door now with one of these fluidic oscillators for sale, we would buy one; however, no one has picked up the ball and run with it."

Spraker emphasized that Scott has not progressed far in their development efforts and expressed concern at the pace. However, he said that the idea still looks highly promising, and that he hopes someday an instrument could be developed to measure the moisture under the hoods in the drying process.

DCC:bg
9/11/68

Case Number: 80403739

Orion Products Company, Inc. has utilized a JPL process as a means to confirm the technical feasibility of a concept it had been studying.

Subject	Technology Source
Orion Products Company, Inc. 154 San Lazaro Avenue Sunnyvale, California 94086 408-245-4479 Contact: John F. Wood Vice President	Jet Propulsion Laboratory Tech Brief: 67-10005

John F. Wood, Vice President, reported that the information developed by Dr. Robert Nathan and R. H. Selzer and reported in the Tech Brief "Digital Computer Processing of X-Ray Photos" was extremely valuable to his organization. He said, "the work described in this reference Tech Brief is, in my estimation, outstanding relative to its potential uses to industry, government and humanity if utilized correctly." He continued, "The work performed in NASA Tech Brief 67-10005 proves feasibility of techniques that we, as a small private development firm, could not financially support. We are thus able to back up and support our concepts through the work that has been performed by this agency."

Orion Products Company, Inc., a part of Sangamo Electric Company, is a small research and development firm located in Sunnyvale, California. It employs approximately 15 people of whom 8 to 10 are professional engineers or scientists. Orion Products has been in existence for approximately three years. Its first two years were mainly concerned with study contracts in the areas of digital data, information storage and instrumentation for organizations such as Lincoln Laboratories. During the last year, hardware has been developed and produced.

Wood reported that his organization has been advancing the state-of-the-art ir the bulk storage of digital data. He discussed the developments in high-speed tape transport and the acceptance of very wide band data. It was thought that the advances in the field could have application in radar analysis and recording, pictorial recording or commercial television. He said that the JPL information had confirmed the feasibility of development work which had been pursued by his company, and added that the capability was now present to put a workable system together. Proposals and marketing are underway. Wood concluded, "There is a

Case Number: 80403739 (Cont.)

possibility of opening up new market areas. Techniques developed by agency, when combined with our development, will possibly provide industry with new commercial products."

Orion Products has invested approximately 160 manhours in reviewing, studying or applying the NASA information. This investment included a trip by Wood to Jet Propulsion Laboratory in Pasadena for discussions with Dr. Nathan and Fred Billingsley. Wood reported that these discussions provided considerable information in addition to that presented in the Tech Brief and its supporting material. He reported that he would have made arrangements to talk with the inventors even if it would have required travel to a more distant location since personal discussions about the technical aspects were viewed as critical.

TDB:mc
10/11/68

Case Number: 80503920

The Lisk-Savory Corporation, Kelley Machine Division, Buffalo, New York, used a review of literature on reduction of hydrogen embrittlement to specify a procedure to improve high tensile fasteners. The literature review was produced for NASA by staff members of the Battelle Memorial Institute.

Subject	Technology Source
Lisk-Savory Corporation Kelley Machine Division 1165 Clinton Street Buffalo, New York 14240 716-825-8300 Contact: E. L. Klopfer Chief Engineer	Marshall Space Flight Center Tech Brief: 67-10141

Mr. Ed Klopfer, Chief Engineer of the Kelley Machine Division, Lisk-Savory Corporation, has been concerned for some time with failures of high tensile fasteners used in small construction equipment manufactured by his company. He ascribed some of the failures to poor quality control by vendors of the fasteners, but also suspected that hydrogen embrittlement might be the cause of many failures.

Hydrogen embrittlement is a generic term for a variety of brittle failures of ultrahigh-strength steel under relatively low stress conditions. The phenomenon is caused by the presence of atomic hydrogen in the steel, and entry of the hydrogen occurs easily unless tight controls are used during cleaning, pickling, and electroplating processes. However, it is possible to correct for excessive hydrogen content.

Mr. Klopfer was working on corrective procedures involving post-heat treatment when he became aware of the NASA document. He reviewed the material for three hours and was assured that his methods were properly directed. The main benefit of the NASA document was that it enabled him to alter the temperature limits of his treating process and achieve optimum control.

Savings resulting from the innovation are impossible to estimate at this time. Mr. Klopfer thought that he would be able to estimate the degree to which the treatment actually reduces failures only after a year. During this period, the equipment would be used under a variety of temperature and operating conditions.

Case Number: 80503920 (Cont.)

Mr. Klopfer commented that hydrogen embrittlement has been a known problem for years, but definitive information has been quite scarce. The standard materials handbooks are nearly silent on the subject. Thus, he considered the NASA document as a uniquely valuable information source.

Kelley Machine Division receives NASA documents regularly. Mr. Klopfer orders them, circulates them throughout the d vision and maintains a master file. Tech Briefs and Technical Suppor: Packages have been used by personnel in R & D, engineering, machine shop, and on the production line.

Mr. Klopfer commented that the quality of Tech Briefs is "very good." He finds them useful primarily to attract his attention to subjects and documents which deserve deeper study.

WH:bg
8/7/68

Case Number: 80504658

C. M. Adams, Jr., Professor of Metallurgy at Massachusetts Institute of Technology, is using three handbooks concerning nondestructive testing with eddy currents. The handbooks were compiled by General Dynamics, Convair Division, under contract to NASA's Marshall Space Flight Center.

Subject	Technology Source
C. M. Adams, Jr. Professor of Metallurgy Massachusetts Institute of Technology Cambridge, Massachusetts 02139 617-864-6900 Ext. 3239	Marshall Space Flight Center Tech Brief: 67-10374

Professor C. M. Adams, Jr., is using three NASA handbooks dealing with nondestructive testing by means of eddy currents. He uses them as reference sources in his private consulting work with industrial clients. Professor Adams characterized the handbooks as useful primarily in a negative sense: they provide guides to identify situations in which the eddy current technique is unworkable. He has used the information largely in the context of detecting weld flaws, and found the handbooks to be useful as a "crutch" which aids him in advising, with some assurance, on the usefulness of the technique.

The material is not used in course work at MIT, except in a very limited way. Courses in casting and welding deal with nondestructive testing, but the subject is a minor consideration in the totality of the course, and eddy current testing is given only passing comment.

Other sources of information concerning eddy current testing are less useful than the NASA information, according to Professor Adams. He observed that the technique is not well understood; in fact, it has long been "mysterious." The alternate sources of information on the subject are all in the nature of proprietary and promotional materials. These tend to glorify the technique beyond its actual usefulness, and the NASA information is considerably more objective in his view.

Professor Adams is a regular recipient of Tech Briefs. He ordered the Technical Support Package which was comprised of the three handbooks as a matter of general interest, although he had previously had occasion

Case Number: 80504658 (Cont.)

to answer clients' questions concerning eddy current testing. He spent about five hours evaluating the information and was able to use it immediately in his consulting work.

Professor Adams commented that only about five percent of the Tech Briefs and other NASA publications which he receives are of immediate utility. The other 95 percent are on file in the departmental reference library, but are not widely used because of indexing problems. He thought that the MIT library maintains a complete collection of NASA documents. The personnel of MIT's Instrumentation Laboratory use Tech Briefs extensively, but so far as he knows, very few members of the instructional staff use them.

Concerning the Tech Brief as a dissemination instrument, Professor Adams noted that they may be an example of the proverb, "A little knowledge is a dangerous thing." He clarified this by observing that the information in a Tech Brief may convey misleading information to a novice. He thought that only a seasoned professional could take full advantage of the Tech Briefs without following too many blind alleys. He personally ". . . pays close attention to them."

WH:cp
8/20/68

Case Number: 80504796

Dr. F. W. DeMoney is utilizing the NASA handbook on Inconel Alloy 718 in his committee work for the American Society of Mechanical Engineers (ASME). This handbook was developed for Marshall Space Flight Center by Syracuse University Research Institute.

Subject	Technology Source
Dr. F. W. DeMoney Kaiser Aluminum Mechanical Corporation Department of Metallurgical Research Spokane, Washington 99215 509-926-1541 Contact: Dr. F. W. DeMoney Technical Supervisor Department of Metallurgical Research	Marshall Space Flight Center Tech Brief: 67-10282

Dr. DeMoney is chairman of the ASME Subgroup For Non Ferrous Materials. This Subgroup, consisting of approximately 15 people, is currently revising and updating the ASME Boiler Code. In doing this, they are dealing primarily with the addition and expansion of Division Two of the Code which lists factors of safety and rupture values of various materials used in boilers. One of these materials is 718 Inconel.

Primary data concerning this material is made available by the International Nickle Corporation who produce the material. The NASA handbook will be used to give supplementary and supporting data for the consideration of the committee members. Principle purpose of the revision and updating of Division Two is to set standards for more efficient and light weight boilers. Dr. DeMoney stated that the availability of the NASA information might effect a saving of time and money in developing the new code. The codes for many materials are being revised this time, and Dr. DeMoney estimates the total time spent for revision of the Boiler Codes at approximately one year. Of this time, some three to six months will be utilized in review by other groups.

This was Dr. DeMoney's first experience with NASA data and he found the information satisfactory. He receives Tech Briefs on a regular basis, forwarded to him from the company library. The library reviews Tech Briefs and forwards them on the basis of interest profiles. Dr. DeMoney stated that some individuals' experience within the

Case Number: 80504796 (Cont.)

company has been that the Technical Support Package did not conform to the information advertised in the Tech Brief.

ROM:bp
10/10/68

Case Number: 80504863

A Kennedy Space Center idea serves as the basic input for a new receiving inspection technique at a major midwestern manufacturer.

Subject	Technology Source
A midwestern manufacturer Contact: Tool research engineer	Kennedy Space Center Tech Brief: 66-10537

The manufacturing research center of a major midwestern manufacturing company is investigating a new approach for receiving inspection of flared tubing. The idea, developed by Francis D. Griffin, provides a device capable of detecting the accuracy of a tube flare efficiently and economically. The company representative reported that the information provided an insight into the problem which might not have been thought of otherwise.

Three hundred hours have been programmed for investigation of this new inspection technique. A prototype device has been developed to verify the angles of the flared tubing with promising results. Approximately 150 hours have been applied in developing this technique, although additional time will be required to investigate its applicability in verifying roundness of the tubing. Nevertheless, initial results are "promising."

There is no satisfactory way to judge the conformity of incoming flared tubing to procurement specifications. If this technique proves satisfactory, it is anticipated that potential savings will be realized by the elimination of considerable reprocessing of finished products. For example, the level of reprocessing of hydraulic lines might be reduced if materials conform better to specifications. However, it is considered that more investigation must be conducted in the performance of this approach until these savings can be achieved.

Tech Briefs are received and reviewed by one individual within the organization. He screens the incoming material and routes applicable items to interested parties. It was in this manner that the tooling area became aware of this invention.

TDB:bp
10/4/68

Case Number: 80505054

Scott Aviation Corporation, a division of Automatic Sprinkler Corporation of America, uses a Trans World Airlines developed management technique called Vis-A-Plan to maintain control over all of its engineering and development projects and some production runs.

Subject	Technology Source
Aero/Hydrospace Division Scott Aviation Corporation 225 Erie Street Lancaster, New York 14086 716-683-5100 Contact: Charles C. Jennings Division Manager	Kennedy Space Center Tech Brief: 67-10240

The Scott Aviation Corporation has 600 employees, performs work for a variety of customers including the U. S. Government, and produces breathing and other aircraft equipment. Its annual volume of sales exceeds $10 million. A substantial portion of the employees are engineers who are engaged in an average of 10 to 12 engineering projects at any particular point in time. These projects carry an annual volume of approximately $2 million.

The company has been looking for a new technique to manage and control its engineering projects. The primary problems experienced by the company had been cost and time overruns.

In the spring of 1968, Mr. Charles Jennings, Manager, Aero/Hydrospace Division, read Tech Brief 67-10240 which describes the Vis-A-Plan (Visualize A Plan) management technique developed at the Kennedy Space Center by Trans World Airlines. The primary attributes of this technique are its simplified presentation of key events and dates. Further, it can be used to present PERT data using a time scale. Jennings and other members of management spent approximately 20 hours evaluating the system and then made a decision that it fit the needs of the company better than anything they had seen up until that time. Jennings said that it was not necessary to contact the individuals who developed the plan since the Technical Support Package was quite detailed. Since company management had been grappling with the project control problem for a number of years, it was generally familiar with a variety of techniques that could be used to accomplish this job.

Case Number: 80505054 (Cont.)

The company began transferring its engineering projects to Vis-A-Plan in the spring of 1968, and by August of the same year most projects were being controlled with this technique. A clerk posts the results and data received. No other staff time is required to maintain the plan.

Jennings characterized Vis-A-Plan as a "tool that we trust." In attempting to place a value on the system, Jennings said that on any given project the system is worth from a 10 to 20 percent improvement in elapsed time and that he would guess that costs are reduced by 10 percent, or $200,000. Jennings characterized these savings as "very significant."

DCC:bg
9/11/68

Case Number: 80505151-2

A patent attorney at an aerospace manufacturing company reviews NASA documents in his search for prior art before filing patent applications for innovations developed by his company.

Subject	Technology Source
Eastern aerospace manufacturer	Marshall Space Flight Center
	Tech Brief: 67-10282
	67-10301

One of the attorneys in the patent department of a large eastern aerospace manufacturing company has the duty of reviewing company produced innovations to assess the possibilities for patent action. As part of this review, he must attempt to discover whether any prior art exists which would invalidate the company's patent claim.

This company is a NASA contractor. In order to determine if other NASA contractors have developed similar innovations, the patent attorney reviews Tech Briefs and orders Technical Support Packages where work similar to his company's is indicated. In this way, he sometimes discovers that prior art exists on items for which he would normally have filed a patent. This review then saves the time and expense of filing a patent application. The patent attorney spends approximately two hours per week in reviewing these NASA documents and is particularly interested in the field of metallurgical engineering and research. He states that, to his knowledge, he is the only patent attorney in this company to utilize NASA documents in this way.

He also uses NASA Tech Briefs and Technical Support Packages to demonstrate to the company's engineers the manner in which they should report innovations arising from NASA contracts. He stated that this saves him much time and effort in that the necessary rewriting of the engineer's report is much less than those cases in which the engineer has not seen NASA documents previously.

This attorney receives NASA Tech Briefs directly although the company's library system also receives the documents. He was satisfied

Case Number: 80505151-2 (Cont.)

with the quality of the NASA documents in general although he stated that Technical Support Packages sometimes presuppose knowledge with which he is not familiar.

ROM:bg
9/3/68

Case Number: 80505170

The Dover Corporation, Memphis, Tennessee, is using three NASA handbooks dealing with nondestructive eddy current testing procedures.

Subject	Technology Source
Dover Corporation Elevator Division P. O. Box 2177 Memphis, Tennessee 38102 601-393-2110 Contact: D. J. Arbogast Field Engineering Coordinator	Marshall Space Flight Center Tech Brief: 67-10374

Dover Corporation in-plant training programs will incorporate as text materials three NASA handbooks dealing with nondestructive eddy current testing techniques. Promotions to supervisory positions from the ranks often require additional training of people with limited formal educational background. The company, therefore, maintains an extensive training program geared to the needs and backgrounds of trainees. Mr. D. J. Arbogast commented, "We are highly encouraged by programmed instruction and learning. We believe it facilitates any training, and find this (material) well prepared for general consumption."

The company occasionally experiences materials problems caused by quality control deficiencies in the operations of its suppliers. The problem is periodically acute, and Mr. Arbogast had decided that the company should acquire a capability to test the quality of purchased materials. A materials manufacturer had previously published a manual which was being evaluated by Arbogast when he learned about the NASA documents. He selected the NASA materials for company use because they were "better and more complete." Two staff members have been trained and are now developing a program to train others to perform nondestructive tests on purchased materials. Mr. Arbogast estimated that the NASA handbooks saved the company $4,000 in training costs for these two staff members. About 136 manhours have been expended on the program.

Dover Corporation subscribes to the Tech Brief program. Mr. Arbogast reviews the Briefs and routes them to appropriate sections of the company, where individual files are maintained. He stated that only about five percent of the Briefs are of interest to the company, but the format

Case Number: 80505170 (Cont.)

is useful because it draws attention to significant materials. Mr. Arbogast's only criticism of the program was that it is sometimes difficult to locate additional material. He tempered the criticism with the observation that the conciseness of Tech Briefs and Technical Support Packages would likely be lost if they included bibliographies and vendor lists.

NASA documents are widely used in the company, by personnel in Research and Development, manufacturing, and the service department.

WH:bg
8/8/68

Case Number: 80505202

A small East Coast electro-optical firm has built prototype models of a low power light modulator. A Technical Support Package developed by Sylvania Electronic Systems under contract with NASA provided considerable information for development of the device.

Subject	Technology Source
Small electro-optical firm Contact: President	Marshall Space Flight Center Tech Brief: 67-10289

Engineers at Sylvania Electronic Systems developed a wideband, high efficiency optical modulator under contract with NASA. Their instrument requires only 10 watts of drive power, in contrast with earlier models which required as much as 270 watts.

The President of a small electro-optical company had communicated with B. K. Yap, one of the Sylvania report authors, about the innovation prior to publication of the Tech Brief. He was promised a copy of the report but upon failing to receive it, he began a close scrutiny of new issues of Tech Briefs. He found the pertinent Tech Brief and acquired the Technical Support Package from NASA.

Development of a new light modulator began with reception of the NASA document. Other information sources were also used, including several articles which appeared in Quantum Electronics. About 35 hours were devoted to review and evaluation of the NASA materials, but because of the multitude of inputs it is not possible to specify either costs or savings associated solely with the Technical Support Package. The only information used from the Technical Support Package was related to treatment and alignment of the crystals used in the device.

A prototype model is being tested, and the president estimated first-year sales of $100,000.

The firm subscribes to NASA Tech Briefs, which are circulated among the three-member engineering staff. The president, who is also the Engineering Manager, has recently become deeply involved with sales promotion duties. As a result, his exposure to Tech Briefs is becoming limited to review and evaluation rather than actual workbench use.

Case Number: 80505202 (Cont.)

The company is highly specialized and only one or two Tech Briefs have been genuinely useful. However, the president mentioned that many other documents have been interesting to him, largely as a matter of broadening his interests and deepening his knowledge of certain fields.

WH:cp
9/11/68

Case Number: 80505209

Del Mar Engineering Laboratories, Los Angeles, California, is in the process of evaluating a Kennedy Space Center developed phonocardiogram simulator for use in the development of an automatic blood pressure monitoring system for clinical use.

Subject	Technology Source
Del Mar Engineering Laboratories 6901 Imperial Highway Los Angeles, California 90045 213-674-2241 Contact: Alan Wong, Product Design Supervisor	Kennedy Space Center Tech Brief: 67-10239

Del Mar Engineering Laboratories hopes to develop an external automatic blood pressure monitoring system which makes use of phonocardiograms as verification of the monitored pressures. Primary application will be clinical uses, according to Alan Wong, Product Design Supervisor. The decision of whether or not to produce the system commercially is to be forthcoming in the summer of 1969. Current evaluation of the phonocardiogram simulator points to the need of making considerable modifications in circuitry designs in order to manufacture the system on an economically competitive basis.

Sales and pricing figures will not be available until a positive decision is made to offer the monitoring system commercially. Available cost figures were given in manhours spent on reviewing and evaluating the information. As of our telephone conversation on October 3, 1968, Mr. Wong estimated that 40 manhours had been spent by various members of his Product Design group. However, the prototype stage has not yet been reached for inservice evaluation of the system.

Mr. Wong believes that the information has definitely saved development time and money. He went on to state that the savings will increase considerably once the prototype stage has been reached. The major savings will be related to design since the information in the Technical Support Package is pertinent to the design problems of the proposed monitoring system.

Mr. Wong first came into contact with the NASA information through excerpts published in the business press. Since his group was charged

Case Number: 80505209 (Cont.)

with the task of designing the automatic blood pressure monitoring system, he decided to order the Brief and Technical Support Package which seemed to be related to the task. He knew of no other sources of information from which he could have obtained essentially the same information.

Del Mar does not receive NASA publications on a regular basis. Mr. Wong is currently in the process of becoming a Tech Brief recipient in his efforts to expand his Product Design group's technical library. His general impression of these NASA documents, from a sample of one Tech Brief and Technical Support Package, is that the authors 'become" . . . too excited with their research findings to get into an explanation of the circuitry used in obtaining the findings." Other general comments, however, were highly complimentary.

DRL:bp
10/3/68

Case Number: 80505221

M. C. Manufacturing Company, Lake Orion, Michigan, experimented with NASA information regarding suppression of high transient voltage in relays. A finished marketable design was not achieved.

Subject	Technology Source
M. C. Manufacturing Company P.O. Box 126 Lake Orion, Michigan 48035 313-692-2711 Contact: Glyn Bindon	Kennedy Space Center Tech Brief: 67-10031

M. C. Manufacturing Company development personnel expended 200 manhours in the development of three prototypes of a bifilar winding for coils to suppress transient voltages. A NASA employee, C. M. Marion, invented the device which increases the decay time of the magnetic field of a charged coil.

Glyn Bindon reported that M. C. Manufacturing Company ordered the information after a notice regarding it had appeared in a trade publication. The Company was planning to bid on a contract to provide solenoid valves for the Manned Orbiting Laboratory (MOL), but did not actually bid because of incompatibility between its solenoid design and the MOL fuels.

Zener diodes had been used in previous solenoid designs, but the company hoped to achieve greater reliability with the new technique. Before experimentation was suspended, Mr. Bindon's group built three prototypes in an attempt to reduce the size of wire for the suppression winding while maintaining an upper limit on voltage parameters. A difference of only two gauges between the actuation and suppression windings increased the voltage beyond tolerable limits. Experimentation was suspended at this point because of a decision not to bid on the MOL contract.

Mr. Bindon stated that he could not have attempted his experiments without the NASA information. No other sources of information on the subject were known, as this appears to be a unique innovation.

WH:bg
8/6/68

Case Number: 80505224

This small design company was unsuccessful in applying the information into development of a commercial product.

Subject	Technology Source
Dimensional Concepts, Inc. 28 East Jackson Boulevard Chicago, Illinois 60604 312-922-2047 Contact: Mr. James Simmons President	Kennedy Space Center Tech Brief: 66-10626

The president of this small company (five employees) described his firm's activities as a "think box" which undertakes design problems usually beyond the scope of their clients' in-house capability. They tend to design unusual things, and subcontract the manufacturer of these items.

There is a small market for unusual, expensive gifts for executives. For example, a calendar is marketed in the form of a clay tablet which is wall hung. Each month is a separate tablet. Also produced as executive gifts are ancient weapons, and gold-plated, operable gear drives.

They are also working with powdered encapsulated water, thermo plastic piers for aquatic uses, and a number of other somewhat unusual applications.

From a Tech Brief, Mr. Simmons ordered the supporting information on a hydraulically controlled flexible arm capable of bending in any direction. It has not been developed into a commercial product because of their inability to identify a specific use.

The supporting information he received was "sketchy and inadequate" for his purposes. He would have liked to have known more about, for instance, what kinds of machines are being made with this principle? For what purpose? Who is working with the idea?

JJR:mc
10/14/68

Case Number: 80505246

Flow-Dyne Engineering uses Tech Briefs to keep up to date in its areas of interest, and on occasion, incorporates the technology into its designs.

Subject	Technology Source
Flow-Dyne Engineering, Inc. 3701 W. Vickery Fort Worth, Texas 76107 817-732-2858 Contact: L. O. Pendleton	Kennedy Space Center Tech Brief: 67-10437 Marshall Space Flight Center Tech Brief: 67-10440

Flow-Dyne Engineering is a small, specialized consulting engineering firm which designs and manufactures flow meters, fittings, piping, etc. for technically oriented companies. It receives and reviews Tech Briefs in its primary field as well as in those areas having to do with lubrication, electromechanical devices, control mechanisms, valves, and electrical systems.

L. D. Pendleton, Vice President for Engineering was especially impressed with NASA Tech Brief 67-10437 having to do with high pressure (10,000 PSI) piping materials. Although the information contained in the Tech Brief and Support Package has not been applied, Mr. Pendleton is maintaining the information in his files and is sure that at some future date it will influence him and his associates in their design of flow meters.

Mr. Pendleton said that this particular Tech Brief is one of many that the company has found of value in their designs. It is his feeling that there is a tremendous need for translation of aerospace-developed technical data to commercial uses.

Pendleton also noted that the Fluid Properties Handbook developed by NASA has been very helpful to his firm. He said that if the company didn't have this, it would not be able to design meters that are as accurate as they are. He went on to say that the development of

Case Number: 80505246 (Cont.)

handbooks of this type is where NASA can really make a contribution. He added that having such handbooks makes communication among engineers much easier and more productive.

DCC:bg
9/11/68

Case Number: 80505313

The Engineering Materials and Processes Information Service of General Electric Company has used NASA Materials Reference handbooks as background and reference material when preparing its materials property data volumes.

Subject	Technology Source
General Electric Company Engineering Materials and Processes Information Service (EMPIS) One River Road Schenectady, New York 518-374-2211 Contact: Dr. Hugh Winn Manager, EMPIS	Marshall Space Flight Center Tech Brief: 67-10089

General Electric's Engineering Materials and Processes Information Service (EMPIS) is the division of General Electric responsible for publishing standard materials information. The data are used both within General Electric and by firms who contract with General Electric for this service. The service is about three years old and arose from a recognized need within General Electric to have standardized materials properties data available throughout the company.

Approximately twelve thousand materials are covered in EMPIS information documents. Information on these materials is updated continuously.

In the EMPIS System, information on materials is arranged in approximately seventy volumes under three headings, as follows:

1. Properties: These volumes cover physical and mechanical properties of the materials including such things as machinability and reaction to various environments.

2. Specification Books: These volumes list specifications on materials which are needed by purchasing, receiving and inspection departments.

3. Data for Ordering: These volumes give sources of supply and other necessary data which are required for buyers to intelligently place orders for the material.

Case Number: 80505313 (Cont.)

The above three items are used within the General Electric system and may be purchased for $25,000 per year by outside firms. The $25,000 price includes periodic updating and maintenance. Partial sets may be acquired for a reduced price.

In acquiring information for the EMPIS System, G. E. relies on the open literature published on various materials and upon test results and literature obtained within G. E. EMPIS is a regular receiver of NASA Tech Briefs through Dr. Winn. He reviews the Tech Briefs and then orders material which appears to be pertinent to the EMPIS activities.

Dr. Winn stated that he was "quite pleased, in general, with material data compilations received from NASA." He particularly praised the NASA material reference documents because they are specifically oriented towards known materials. This is of more value to the EMPIS activity than some commonly used specifications which refer to generic groups of materials rather than a specific formulation or alloy.

ROM:bg
9/5/68

Case Number: 80505485

Consolidated Electro Dynamics Corporation improved its operations through a change in its inventory control computer program.

Subject	Technology Source
Consolidated Electro Dynamics Corp. 360 Sierra Madre Villa Pasadena, California 91109 213-796-9381 Contact: Mr. T. W. Fleming Division Contracts Manager	Space Nuclear Propulsion Office Tech Brief: 67-10348

This company was performing data processing contract research on spare parts control for the Armed Services Parts Processing Division. While engaged in this activity, the Division Contracts Manager received a xeroxed copy of a magazine article describing an approach to a computerized parts list system. He subquently ordered and received a Technical Support Package.

Drawing upon both these experiences, some 15 manhours of programming effort were devoted to modifying the company's own inventory control computer program. Mr. Fleming was unable to assess the economic saving of changing the reporting format to reflect an indentured parts list approach.

Commenting on the specific Technical Support Package, Mr. Fleming stated that is was too complex. He thought it contained too many frills. However, the basic idea was good, and his company used a more simplified approach in developing its program.

JJR:mc
10/14/68

Case Number: 80505521

This case is an example of an inhibited information application due to a combination of personnel difficulties and the start-up troubles of a new data processing system.

Subject	Technology Source
An electronic aeronautical instrument manufacturer Contact: Engineering	Space Nuclear Propulsion Office Tech Brief: 67-10348

The Tech Brief and supporting materials illustrated a method to coordinate engineering releases, parts control, and manufacturing planning on a computer. The subject company had recently converted to a more powerful computer and had plans to develop a new inventory control system.

In order for the present semi-automated, parts control system to function, it must be supplemented by extensive clerical operations. For example, if the components of an assembly are changed (add two parts, drop one) the computer will make the additions, but not the deletions.

Administratively, the engineering department of this 450 employee company has no authority over the materials control people and the data processing manager. Our contact, the engineering manager, has been unsuccessful in his attempts to encourage these other departments to develop a fully automated inventory control system. He states that an incompetent manager was recently fired and replaced by one who is less qualified. The engineering manager thinks that if a first-class automated system can be implemented, there will be a potential saving of perhaps $10,000 per month.

The engineering manager was well pleased with the information received; he emphasized that the difficulty lies within his own organization.

JJR:mc
10/14/68

Case Number: 80505682

Todd Shipyards Corporation, Nuclear Division, Galveston, Texas, is using two NASA fluidics handbooks for a project to develop a fluidic control system. The system will be used in marine applications.

Subject	Technology Source
Todd Shipyards Corporation Nuclear Division P.O. Box 1600 Galveston, Texas 77551 713-SH4-5331 Contact: W. H. Mackay	Marshall Space Flight Center Tech Briefs: 67-10438 67-10440

Shortages of experienced seamen in recent years have induced shipbuilders to introduce automated control systems for many on-board applications. Todd Shipyards Corporation, Nuclear Division, is developing a fluidic control system for use in ships being reconditioned from the mothball fleet. Mr. W. H. Mackay anticipates that the system will provide highly reliable controls. Development has been retarded approximately six months because the company is engaged in a refueling operation on the nuclear ship Savannah.

About 50 hours have been devoted to review of the NASA handbooks and other material. The literature provides both general fluidics background and detailed circuitry schematics. In addition to the NASA documents, Todd has acquired considerable information from vendors, including Pitney-Bowes and Corning.

The fluidics project was undertaken as a result of frequent failures of a specialized controlled ship system. There are considerable disagreement among personnel of two divisions in the company--the instrumentation division and the division which manufacturers the controlled components. The solution was a joint venture to develop a fluidic control system. So far, only one division has used the NASA documents.

Todd Shipyards Corporation is a subscriber to NASA Tech Briefs. The Tech Briefs are circulated throughout the Nuclear Division, but most

Case Number: 80505682 (Cont.)

of the actual use of the information is by R & D personnel. Mr. Mackay commented that all the Tech Briefs he has used have been "helpful and interesting," but that they would be improved if they contained "more detail."

WH:cp
9/10/68

Case Number: 80505689

A method for in-circuit testing of semiconductors, developed by North American Aviation for NASA, has been adopted by ITT Semiconductors, West Palm Beach, Florida.

Subject	Technology Source
ITT Semiconductors Electronics Way West Palm Beach, Florida 305-842-2411 Contact: W. P. Heitzman Applications Engineer	Marshall Space Flight Center Tech Brief: 66-10447

Special circuitry for an oscilloscope makes possible a variety of checks for semiconductors without removing them from their circuits. ITT Semiconductors used a NASA Technical Support Package describing the techniques to establish the procedure for go/no-go quality control evaluations.

Mr. W. P. Heitzman commented that the approach was not new, but the NASA information was readily available. He became aware of the document from a trade press notice and ordered it as a matter of general interest. He later encountered a problem to which he successfully applied the techniques.

About 36 manhours have been used in connection with the innovation. Mr. Heitzman estimates that the NASA information may have saved the company as much as $2,000 in time that would have been used to develop the same material internally. No other sources of information about the subject were known to him, but he categorized the innovation as one that any qualified engineer could develop if he had the time and inclination.

This NASA package has been used by personnel in the company's research and development section, device evaluation section, and by applications engineers. To Mr. Heitzman's knowledge, no other such documents have been used in the company.

WH:bg
8/8/68

Case Number: 80505705

The Amphenol Corporation, Chicago, Illinois, has used a NASA developed technique for in-circuit testing of semiconductors. The contract for which the work was performed has been completed and the technique is not being used at the present time. However, the company will definitely implement it again should the need arise.

Subject	Technology Source
Amphenol Corporation 1830 South 54th Avenue Chicago, Illinois 60650 312-242-1000 Contact: Ed Tatara, Process Engineer	Marshall Space Flight Center Tech Brief: 66-10447

B. C. Allen of North American Aviation discovered a method for testing semiconductors without removing them from the circuit, and disclosed the technique to NASA. A Tech Brief was published on the innovation, which has been implemented by Amphenol Corporation. An ordinary oscilloscope is modified with special circuitry to enable bench testing of semiconductors and their circuitry without removing them from the circuit.

Mr. Ed Tatara of Amphenol reported that about a year ago the company had a contract to build a module incorporating about 80 semiconductor devices. The module required a special troubleshooting method because of its complexity and Mr. Tatara began a search for such a method. He noticed mention of the NASA Tech Brief in Circuits Manufacturing and ordered the information. The test equipment was then assembled and the technique used with great success to check out the module. The contract has since been completed, and the company is no longer using the technique. However, Mr. Tatara commented that they would certainly use it again if the need arises.

The innovation could probably be developed by nearly any well trained engineer, but Mr. Tatara was unable to estimate how long it would have taken him to do so. Therefore, he was unable to indicate the magnitude of savings in development time. Costs associated with the innovation amounted to 200 manhours.

Case Number: 80505705 (Cont.)

Amphenol has an extensive library which regularly receives NASA publications. The publications are kept in the library and personnel desiring to use them must go to the library and conduct a search. Evidently no attempt is made to circulate the Tech Briefs throughout the company.

The primary users of NASA documents are personnel in R & D. Production workers could conceivably use the information, but the practice in the company is for production problems to be referred to R & D engineers. These engineers then conduct a literature search appropriate to the solution of the problem.

WH:cp
8/14/68

Case Number: 80505737

A test program to determine an optimum gasket material to prevent fretting corrosion of contiguous metal parts is underway in the materials laboratory of a large Ohio power equipment manufacturer. The innovation originated with North American Aviation, Inc. under contract with NASA.

Subject	Technology Source
Ohio power equipment manufacturer Contact: Materials Engineer	Marshall Space Flight Center Tech Brief: 66-10681

R. L. Stremel of North American Aviation, Inc. developed a technique to reduce fretting corrosion in axial joints composed of metals of varying hardness, or wherever alloys with an affinity for each other are in close stressful contact. The conventional preventive measures used in such cases involve expensive plating of one or both surfaces. Stremel's innovation - insertion of a very thin sheet of plastic gasket between the mating surfaces - completely eliminates fretting corrosion and is very inexpensive.

Materials engineers employed by a large Ohio manufacturer are conducting extensive tests to find an optimum gasket material for use in a male-female spline. Following the current effort to select the most appropriate base heat treatment for the metal parts, plastic, nylon, and teflon are among the alternative materials to be tested.

The test program will last at least six months, and possibly a year. The NASA information provided the basic idea, but is not expected to save any development time since the company's experiments go well beyond the NASA innovation. If the development program is a complete success, the innovation will significantly increase the useful life of the parts involved. These parts now are relatively maintenance-free for 1,000 hours and the innovation should increase the maintenance-free period to 5,000 hours. The innovation will be incorporated in commercial products of the company as well as equipment for military aircraft.

Case Number: 80505737 (Cont.)

Costs of the development program are not precisely estimable, but are expected to consist largely of the professional labor of several people for at least six months.

The company library is a subscriber to NASA Tech Briefs, which are routed to a group of key people. The materials engineers, electrical design staff, and research personnel are the primary users of the documents. Tech Brief 66-10681 was ordered by a materials engineer because it appeared to provide a unique answer to the fretting corrosion problems with which he was concerned. After he had begun to use the document he encountered an article in a professional journal which suggested that nylon might also be a good gasket material. His experimental program then expanded to include several materials other than the plastic sheet discussed in the Tech Brief.

The engineer contacted for this information has used several Tech Briefs in his work, and characterized them as "short and to the point," and generally very useful to him. He also indicated satisfaction with the rapidity of NASA's response to requests for information.

WH:cp
9/3/68

Case Number: 80505935

Alvin B. Auerbach, an instructor at Sacramento City College, reviews all Tech Briefs and distributes them to colleagues who may have an interest in the subject matter reported.

Subject	Technology Source
Sacramento City College 3835 Freeport Boulevard Sacramento, California 95822 916-444-6960 Contact: Alvin B. Auerbach Department of Engineering	Marshall Space Flight Center Tech Brief: 66-10602

In the case of NASA Tech Brief 67-10602, a new technique for determination of cross-power spectral density with damped oscillators, Auerbach said that one of his colleagues has incorporated some of the material in a course taught to students studying technical photography. This particular technique is passed along to the students in a very elementary form. The total class time taken to explain this technique is less than one hour per semester.

Auerbach's opinion of Tech Briefs is that they are generally useful, but he did say that he has been misled or fooled by the material he thought he was going to get in Technical Support Packages. He feels that electronics people do a much better job in their preparation of Tech Briefs, probably because they are able to include diagrams or other means of communication. He also said that he wished NASA would develop a better number system which would enable an individual like himself to better retrieve Tech Briefs for later use.

DCC:bg
9/11/68

Case Number: 80506190-1

An Assistant Professor of Zoophysiology at the University of Alaska is attempting to apply two Ames Research Center physiological monitoring systems. The intended application is implantation in beavers for the purpose of studying how they adapt to the extreme cold in the northernmost parts of this continent.

Subject	Technology Source
Department of Zoophysiology University of Alaska College, Alaska 99701 Contact: L. Keith Miller, Assistant Professor of Zoophysiology	Ames Research Center Tech Briefs: 64-10171 66-10057

Professor Miller has high hopes of being able to use both NASA developed telemetry units in forthcoming research project. The project is designed to study beavers in their natural habitat for purposes of determining how they adapt to the extreme cold encountered in the northern reaches of our continent. A comparative analysis of body temperatures and EKG's of beavers living in their lodges during the summer months and the winter months is planned.

At present, the temperature telemetry unit is functional; however, slight problems with the demodulator have been encountered. The problem encountered with the subminiature biotelemetry unit which permits remote physiological investigations has been with the procurement of the specified transistors which have been found to be ". . . obsolete, or at least obsolescent." Another major problem arising only recently has been that the electronic technician who originally began fabricating the telemetry units has left the employment of the University. Professor Miller is currently stymied in his efforts until another technician is found to replace him.

Professor Miller estimates that an expenditure of approximately $400, covering both components and labor, has resulted from these activities. He believes that this will eventually provide a considerable savings over available alternative telemetry units in both dollars spent and data collection efficiency.

Case Number: 80506190-1 (Cont.)

The original technician had limited success in developing prototype telemetry units for previous research programs. These units are seemingly the answer for this particular project. He contended that all the other information on telemetry having been brought to his attention was inadequate in one respect or another.

Professor Miller's initial contact with NASA information was made through a friend who had been working in the telemetry area in Iowa. The friend told him of the two Tech Briefs which resulted in his information request. The requested Briefs were the first ones he had ever seen. He is not personally familiar enough with the main University library to know whether or not NASA publications are received on a regular basis or not.

Evaluative comments made by Professor Miller about the two Tech Briefs are as follows: "I am fairly impressed, and believe them to be quite thorough especially with respect to the temperature monitoring unit." One objection noted with respect to the Briefs is their specification of hard to procure components. Professor Miller does not believe that the average person attempting to apply this technology has the unlimited access to so many components, especially those that fall in the exotic classification.

DRL:bp,
9/25/68

Case Number: 80506214

A medical research team conducting research on toxicology at the Basic Toxicology Branch, Edgewood Arsenal Research Laboratory, Edgewood Arsenal, Maryland, is currently using an Ames developed biotelemetry system for purposes of measuring biopotential responses in small animals used in their research activities.

Subject	Technology Source
Department of the Army Basic Toxicology Branch Edgewood Arsenal Research Laboratory Edgewood Arsenal, Maryland 21010 301-676-1000, Ext. 24253 Contact: Robert Glover Electronics Section, Technical Support Directorate	Ames Research Center Tech Brief: 64-10171

The medical research team at the Edgewood Arsenal has found the biotelemetry system's circuitry to be more elaborate than was really needed. However, it does work quite well. The team's primary interest is in the measurement of biopotential responses in animals while doing research in the area of basic toxicology. A subminiature biotelemetry system was required to accomplish this. Interest was stimulated in the Ames developed innovation when various members of the research team read an article in Medical Electronic News specifically referencing the subminiature biotelemetry unit. This interest lead to a request by the Electronics Section of the Arsenal's Technical Support Directorate requesting the appropriate Tech Brief and Technical Support Package. Several of the biotelemetry systems have been fabricated as a result of this information.

Mr. Glover, an electronic technician at the Arsenal, stated that there were definite savings in both time and money resulting from this particular application. A major time savings was the elimination of a literature search for applicable information. Another major time savings resulted from the speedy fabrication process: Since the system's design was " . . . laid out quite well, all that was needed was to copy the design schematics." Application costs are not available since all fabrications done by the "Electronics Section" are done on a one or

Case Number: 80506214 (Cont.)

two item basis. Neither component costs nor development hours are recorded. However, cost would amount to a combination of component costs in addition to in excess of 100 manhours of technician time.

The Arsenal's technical library receives NASA publications on a regular basis. In addition to this, there are many individuals also receiving information directly. Mr. Glover believes that he could have found essentially the same type of information in many sources, such as professional journals, the trade press, and technical newspapers and magazines. He believes that the information contained in the Technical Support Package is " . . . well done . . ." and contains " . . . well thought out designs." His major criticism was that the availability of such information should be promoted in a greater variety of publications. He thinks that more emphasis should be placed upon promotion of the availability of NASA information.

DRL:bg
8/21/68

Case Number: 80506218

A large Midwestern electronics company has improved production processes for two-sided printed circuit boards. R & D engineers adapted a new technique from an innovation developed by the Bendix Corporation under NASA contract.

Subject	Technology Source
Midwestern electronics company	Langley Research Center
	Tech Brief: 66-10660

Research and development engineers employed by a large electronics company used the Technical Support Package for Tech Brief 66-10660 to improve registry accuracy between circuit board prints. Obtaining accurate correspondence (registry) between the photographic prints of the two sides of the board is a common problem in the manufacture of two-sided boards. Photographic distortion can produce misregistry errors as large as .01 inch, which complicates component assembly and feed-through hole drilling.

The misregistry problem is readily eliminated by a technique involving the use of red and blue translucent tape to block out circuitry unique to opposite sides of the board. The clear plastic model is then photographed twice from the same side, using blue-insensitive film for one negative and red-insensitive film for the other. Distortion is common to both negatives, and errors are eliminated.

The electronics firm adopted the technique and supplemented it with a light transfer ratio chart which was developed independently by a company R & D engineer. The engineer explained that the new photographic technique is based on transmitted light, and materials having different opacity constitute a light measurement problem. He developed a chart to overcome the measurement problems.

Concerning the translucent tape innovation, the engineer commented that he would probably never have solved his misregistry problems in the manner suggested by the Tech Brief. He was ". . . working along a completely different tangent." He devoted about five hours to review of the NASA information and implemented the technique immediately. He estimated that at least 100 manhours per year are saved by the method.

Case Number: 80506218 (Cont.)

The professional journal of the Society of Photographic Scientists and Engineers provided the initial contact with the innovation. The company does not regularly receive any NASA documents. However, the engineer who was responsible for the adoption of this innovation has used several Tech Briefs, and he evaluated them as ". . . quite good, very well written, and very informative." He did not know if personnel other than those in his section had used NASA documents.

WH:cp
8/26/68

Case Number: 80506223

The American Machine and Foundry Company has succ :sfully tested a technique for improving registry in the production of two-sided printed circuit boards. The technique was developed by Bendix under contract to NASA's Langley Research Center.

Subject	Technology Source
American Machine and Foundry Co. Electronics Division 689 Hope Street Springdale, Connecticut 06879 Contact: William J. Mahoney Asst. General Manager	Langley Research Center Tech Brief: 66-10660

Production processes in the manufacture of two-sided printed circuit boards will be improved at American Machine and Foundry Company's Electronics Division as a result of implementing an innovation developed by Bendix for NASA. The innovation involves the use of red and blue translucent tape on opposite sides of a transparent board to indicate the circuitry unique to that side of the board. A single side is then photographed by filtering out the color of the unwanted side. The results are that the circuitry common to both sides and the feed-through holes are identical on both negatives. Photographic distortion is entirely absent. William J. Mahoney, Assistant General Manager of AMF, reported that his company has fabricated a group of boards using this technique, and it appears to work quite well. He did not know the extent to which the innovation will be used within the company, but he commented that 100% of their work is with very large two-sided boards with about 75 component packages each.

Mr. Mahoney was unable to recall all the ramifications of the uses to which his company is putting the innovation. He called Mr. Sal Palmieri, a production supervisor, to continue the interview. Mr. Palmieri mentioned that they had encountered some minor problems in adapting the innovation to their plant. The problems were largely connected with the tapes used in laying out the circuitry: the tapes were not of uniform quality, and some discoloration and consequent imperfect photographic reproduction was encountered. This problem has been solved, and some savings are now evident. Only one film is used, drafting time has been reduced, and better registration has resulted. Production efficiency is further improved by the increased

Case Number: 80506223 (Cont.)

accuracy of drilling operations. As of June 19, 1968, the company had expended about 100 manhours in implementing the technique.

AMF is a regular subscriber to NASA Tech Briefs, which are stocked in the company library. Users are almost exclusively in research and development functions, but the documentation dealing with improving registration in printed circuit board manufacture was used in the drafting and design section.

WH:cp
8/16/68

Case Number: 80506229

The GAP Instrument Corporation, Westbury, Long Island, New York, has adopted a new drafting technique which simplified artwork used in production of printed circuit boards. The technique was developed by the Bendix Corporation.

Subject	Technology Source
GAP Instrument Corporation 17 Brooklyn Avenue Westbury, Long Island, New York 516-333-8020 Contact: A. C. Cote Design and Drafting Supervisor	Langley Research Center Tech Brief: 66-10660

Assembly of components on two-sided printed circuit boards is generally complicated by basic artwork problems. The use of coincident photographic targets is subject to artwork shrinking or creeping and photographic distortion that often produce misregistry between the two sides of the board. Feed-through holes and conductive paths can be misregistered by as much as .01 inch.

The Bendix Corporation developed a technique to overcome these problems by using a clear transparent plastic artwork base, upon which hole locations and conductive paths are defined by mounting circles and translucent tapes of contrasting colors. Photographic work is done from only one side of the board. Since the artwork is in contrasting colors on the different sides of the board, two negatives are made, each insensitive to one color. Distortions are then common to both negatives and errors are eliminated relative to the feed-through registry.

Mr. A. C. Cote, Design and Drafting Supervisor for GAP Instruments Corporation, reported that his department is using the technique constantly. As a result, accuracy has increased greatly and drafting time has been reduced by 50 percent. Implementation of the innovation was relatively costless for Mr. Cote merely passed the NASA information among his draftsmen who were able to apply the technique immediately and without adaptation.

Case Number: 80506229 (Cont.)

Savings in development time were not apparent because Mr. Cote stated that he probably would never have conceived the idea without the NASA information. The technique is not difficult, but the idea is unique.

Mr. Cote has used only one NASA information package. A trade press article brought this innovation to his attention, and he ordered it to see if it would help solve the common problem of misregistry in two-sided printed circuit board manufacture. He is not aware of any other personnel of the company who have used NASA information, and thought that the company does not regularly receive NASA Tech Briefs.

WH:cp
8/15/68

Case Number: 80506233

Researchers at the University of Colorado's Institute for Behavioral Genetics, Boulder, Colorado, are studying the correlation of EEG readings with learning and activity of mice. They plan to use an Ames developed subminiature biotelemetry unit which permits measurement of biopotential response in humans or animals.

Subject	Technology Source
Institute for Behavioral Genetics University of Colorado Boulder, Colorado 80302 303-443-2211, Ext. 7362 Contact: John Stechman Chief Instrument Maker	Ames Research Center Tech Brief: 64-10171

The research program being conducted at the Institute for Behavioral Genetics is being conducted under a National Institute of Health (NIH) grant. Mice are being used as research subjects for the purpose of learning the correlation between EEG, EKG, and EMG readings, and patterns of learning and activity. It is hoped that the findings will increase knowledge of man, his activities, and thought processes within his normal living environment. The NASA developed subminiature biotelemetry transmitter should facilitate the monitoring of EEG, EKG, and EMG readings while the mice are experiencing sexual relationships. Correlations of these readings and learning patterns and activities could possibly lend much insight to the patterns of emotion and their effects.

John Stechman, Chief Instrument Maker for the Institute, first learned of the NASA innovation from Earle S. Pittman, a design engineer affiliated with the University of Colorado's Department of Pyschology. Mr. Pittman requested Tech Brief 64-10171 and its Technical Support Package in hopes of adding a new product to his part-time biomedical instrumentation business, Devices Unlimited. It was determined by him that this particular innovation did not offer a profitable market at this time. However, there is a continuing interest in the device's modulator which may be used at a later date. Mr. Stechman, as an acquaintance of Mr. Pittman, learned of the innovation and plans to construct the amplifier within the next few months for use in the NIH project.

Case Number: 80506233 (Cont.)

Mr. Stechman believes that the referenced circuitry is " . . . far ahead of normal apparatus." He went on to comment that the plans were " . . . all laid out. Even the mechanics and instructions for building the unit . . ." were very complete. He thinks that between 100 and 200 manhours will be saved when the fabrication process actually occurs.

Prior to learning of the availability of the NASA information, a literature search had been conducted. Results were negligible in finding directly applicable information. In order to obtain alternative sources of information, Mr. Stechman would have had to accumulate many bits of information, resulting in an ineffectual alternative.

Plans are currently underway at the Institute to receive certain subject areas of NASA information on a regular basis. Mr. Stechman is very enthusiastic about the Tech Brief program and feels that it has much to offer by increasing technical state-of-the-art knowledge directly applicable to research activities. Mr. Stechman also suggested that a greater promotional emphasis is needed in order to make the system known among potential users.

DRL:bg
8/20/68

Case Number: 80506283

An Ames developed tiny biomedical amplifier which combines high performance with low power drain is currently being used in the operating room of the Memorial Hospital for Cancer and Allied Diseases in New York City. The amplifier is being used as a new monitoring technique for electrocardiogram and electromyogram readings.

Subject	Technology Source
Memorial Hospital for Cancer and Allied Diseases New York, New York 10021 212-879-3000 Contact: Michael N. Leeming Biomedical Engineer	Ames Research Center Tech Brief: 65-10203

Michael N. Leeming, a biomedical engineer at the hospital, stated that the use of the amplifier has been restricted to use by the anesthesiologists in the operating room. The amplifier actually in use is slightly larger than that described in the Technical Support Package. However, the basic design is identical. The amplifier in use is approximately three-fourths of a cubic inch in size due to use of larger components. Mr. Leeming stated that the major benefit of information was the technical design rather than an identical component fabrication. A modification of the original circuitry to allow for higher input impedance has also worked quite well. according to Mr. Leeming.

When asked about the acceptance of this new technique in the operating room, Mr. Leeming stated that there has been a "fair acceptance as of this time." He feels that many of the doctors previously trained in the wire monitoring technique are slow to change. Acceptance is much better among the younger doctors who have had academic training in newer monitoring techniques.

Costs of application included $50 for components, 3 manhours reviewing the information, and 16 hours in fabrication.

Interest in this particular innovation was stimulated by a review of all Tech Briefs which Mr. Leeming ordered after accidentally discovering two Tech Briefs. The request for the specific Technical Support Package was reinforced by the knowledge that NASA is a "guiding light" in the

Case Number: 80506283 (Cont.)

field of biomedical instrumentation. Mr. Leeming hoped to increase his state-of-the-art knowledge, in addition to learning of new available techniques. He believes that there were no alternatives in obtaining this information, other than commercial sources which he dislikes immensely because of the inevitable "sales hassle."

The Hospital is currently receiving NASA publications on a regular basis after recognizing that significant information is available from this source. Mr. Leeming commented that the Tech Brief program is " . . . fast and quite comprehensive in its information, which is essentially free." He suggested that a possible improvement in the system might involve literature searches specifically tailored for certain information requests.

DRL:bg
8/19/68

Case Number: 80506543

A research team headed by Dr. L. Sherman Watson of the Research Laboratories at Merck Sharp & Dohme, West Point, Pennsylvania, plans to make use of the spray-on electrodes developed at Flight Research Center. The electrodes are to be used in the cardiovascular testing of unanesthetized animals injected with newly-developed drugs.

Subject	Technology Source
Research Laboratories Merck Sharp & Dohme West Point, Pennsylvania 215-699-5311 Contact: L. Sherman Watson, Ph. D. Senior Research Physiologist	Flight Research Center Tech Brief: 66-10649

Application of the spray-on electrodes has not taken place as of this time; however, the methodology is to be used in the near future. The primary application intended is in the monitoring of body potentials from skin surfaces of animals (dogs) in the assessment of new drugs. It is hoped that the results will enable a better understanding of what effects might be expected when new drugs are administered to humans.

Dr. Watson first learned of the innovation through an article published in Medical Electronic News. Thirty-six manhours have been invested in reviewing and planning the future applications to which the spray-on electrodes are to be put at the drug manufacturer's research laboratories. These manhours represent the total investment by Merck Sharp & Dohme at this time. Dr. Watson believes that significant savings in both time and money will accrue once the application phase is reached. He further stated that he knew of no alternative sources of information from which he could have obtained comparable data.

It was learned that requests for NASA publications are made on an individual basis, since the company does not receive them regularly. Dr. Watson's comments about those NASA documents that he has used are as follows: "quality of very high level; as good, if not better than academic research efforts; no criticism at all." Dr. Watson stated that he has had personal contact with the NASA organization and a number

Case Number: 80506543 (Cont.)

of its employees through visits to various field centers and has the highest regard for NASA and its research activities.

DRL:bg
9/25/68

Case Number: 80506546

F. I. Scott, Jr., an independent sales representative located in Montclair, New Jersey, ordered a Technical Support Package which described a means of mounting power transistors on printed circuit boards by incorporating an aluminum heat sink. He recommended the design to an aluminum company, but they decided not to follow through with a development program.

Subject	Technology Source
F. I. Scott and Associates 32 Madison Avenue Montclair, New Jersey 201-746-2074 Contact: F. I. Scott, Jr.	Marshall Space Flight Center Tech Brief: 67-10426

Mr. F. I. Scott, Jr., a consulting chemical engineer and independent sales representative, is a Tech Brief subscriber. He reviews the documents regularly for ideas to use in his consulting and promotional work. One of his clients produces aluminum foil, and he aroused their interest in a NASA developed technique for mounting power transistors on printed circuit boards through use of an aluminum heat sink.

The client spent about three hours reviewing the Technical Support Package and decided not to initiate a program to promote this application of its aluminum products. Mr. Scott made a final effort to salvage the idea by seeking out one of the authors of the Technical Support Package. When he was unable to locate the author, he too dropped the venture.

Mr. Scott stated that Tech Briefs "serve their purpose pretty well." Although he has not yet made money as a direct result of using Tech Briefs, he has found them to be useful in answering questions from clients.

WH:cp
9/11/68

Case Number: 80506554

McDonnell Douglas Corporation has a potential use for an installation tool developed by North American Aviation under contract to Marshall Space Flight Center.

Subject	Technology Source
McDonnell Douglas Corporation St. Louis Municipal Airport Box 516 St. Louis, Missouri 63166 314-232-2961 Contact: Mr. T. W. Morrow Sr. Equipment & Process Engineer	Marshall Space Flight Center Tech Brief: 67-10105

Mr. Morrow is in charge of hand tools for the entire McDonnell Douglas St. Louis facility. This includes both aircraft and space craft manufacturing. In the process of manufacturing these vehicles, many Marmon clamps are used. These clamps are difficult to install and require a tool to aid in closing and holding the clamp while a connecting screw is put in place.

North American Aviation personnel, under contract to Marshall Space Flight Center, developed an improved Marmon clamp installation tool. The Tech Brief publicizing this innovation claims that the tool allows a reduction in the required work force from two to one man, and a great reduction in the time required to install the Marmon clamp.

In reviewing this Tech Brief, Mr. Morrow determined that the tool appeared superior to the one now used at McDonnell Douglas. He thought its use might result in savings in both time and money. While the Tech Brief does not give sufficient information to allow fabrication of the tool, Mr. Morrow stated that it appeared to him that the tool is also cheaper and easier to build than the tool presently in use.

In an effort to acquire more information about the tool, Mr. Morrow has called the innovators at North American Aviation and written letters to North American Aviation and to the innovators. He has been unable to contact any person at North American who would be able to give him more information concerning the tool, and after several tries, Mr. Morrow states that he feels he has used as much time as he possibly can in trying to track down a source of supply for the tool or details on

Case Number: 80506554 (Cont.)

manufacturing the tool. The Technology Utilization Office at Marshall Space Flight has been advised of this problem by Denver Research Institute and will attempt to procure the details for Mr. Morrow.

NASA Tech Briefs are received at McDonnell Douglas through the library system, and Mr. Morrow receives Tech Briefs which are of interest to him through his supervisor. He has used NASA information previously and has found it very satisfactory.

ROM:bg
8/23/68

Case Number: 80506706 (Cont.)

of overeagerness on the part of innovators to "get into print." As an example, he cited a Lewis Research Center document dealing with fatigue analysis. He thought the document should not have been published until the information was more adequate.

WH:bg
10/18/68

Case Number: 80506789

An illuminated seven-power magnifier has been built for use with a Polaroid camera in the metallurgy laboratory of a large oil company. The idea for the magnifier originated with F. L. Moffitt of the Marshall Space Flight Center.

Subject	Technology Source
Research Department of a major oil company	Marshall Space Flight Center Tech Brief: 67-10431

Photographic inspection of welding flaws can be accomplished in a fraction of the usual time by using a magnifying lens with a Polaroid camera. The print is available in seconds, thereby bypassing the time delay associated with developing, enlarging, and printing conventional photographs. A NASA technician developed a device which incorporates a seven-power magnifying lens and an illumination source. Flaws are located with a ten-power magnifying glass and photographed with a Polaroid camera modified by the magnifier device. Quick inspection of the Polaroid print allows a no-delay determination of the seriousness of the defect.

The Senior Consultant on nondestructive testing for a major oil corporation encountered the Tech Brief describing this invention as he conducted his regular review of new Tech Briefs routed to him from the company library. His research laboratory had a Polaroid camera which could be used for such work and he thought the idea was worth pursuing. He inquired of NASA about vendor sources for the illuminator-magnifier device but there were none. Therefore, he routed the NASA documents to the company's machine shop with a request to construct the device. The task was assigned a low priority and several delays were encountered in acquiring the necessary materials. Eight months elapsed before he received the device. He has not yet had time to use it, but he anticipates extensive use by the metallurgy section.

The costs associated with building the device were unknown to the consultant because the work was performed in the machine shop. He thought that savings in development time were not a germane issue because the idea is unique. It would not have occurred to him to build such a device had he not discovered it in the Tech Brief. Thus, the Tech Brief's utility was its suggestion of the idea rather than any details regarding construction of the device.

Case Number: 80506789 (Cont.)

The company receives Tech Briefs on a subscription basis. One person in the library is responsible for routing the documents to personnel according to their needs and interests. If they are relevant to the work of field offices or production workers they would probably be circulated to them, according to the consultant. However, he was certain only that the documents are widely used in the research laboratory.

Concerning the quality of Tech Briefs, the consultant commented that he ". . . wonders why (some of them) are printed." While many of these documents are quite useful, many others ". . . are too elementary to warrant publication. Anybody with training and background in these fields should already know the material." He noted further that some Tech Briefs appear to summarize information from projects that probably cost $20,000 to $30,000. When the knowledge generated in such projects is obsolescent, he judges that his tax money has been wasted. He concluded that his criticism should be understood as applying only to some Tech Briefs; he repeated that he has benefitted greatly from several Tech Briefs.

WH:bg
9/23/68

Case Number: 80506855

General Connectors Corporation reviewed Tech Briefs for the primary purpose of keeping up with new technology in fields related to their area of interest.

Subject	Technology Source
General Connectors Corporation 3223 Burton Avenue Burbank, California 91503 213-849-6801 Contact: Justin E. Ellison, Sr. Vice President	Marshall Space Flight Center Tech Brief: 67-10667

The General Connectors Corporation is a manufacturer of pneumatic systems with about 99 percent of its business being related to the manufacture of commercial aircraft. It presently has 100 employees and a very small R & D staff.

Ellison said that, because their staff is limited they make a special effort to review Tech Briefs and any other technical information that helps keep abreast of what is going on in their field, and, even more important, in related fields. In the case of the solenoid valve design, the Tech Brief referenced was reviewed primarily to gain information on materials and techniques for controlling high pressure and high temperature gases. The company has never actually made any of the valves according to Ellison, nor does it have any plans to do so.

Ellison said that he would not rate Tech Briefs as excellent because there are very few people in his company who can read and comprehend what is in most of these briefs. He said he believes in the Napoleon System where Napoleon is reported to have designated the dumbest man in his Army as a Captain and assigned him the responsibility for reading all orders before they were sent to the field. If this individual could not understand the order, Napoleon had it rewritten and simplified until it could be understood. In opposition to this philosophy, he characterized Tech Briefs as being "German" style, which implies the use of large technical terms. Other than these criticisms, he has been favorably

Case Number: 80506855 (Cont.)

impressed with the Tech Briefs and views them as valuable in keeping his staff up to date in high technology areas where they do not normally perform R & D.

DCC:bg
9/11/68

Case Number: 80607026

A leading Midwest chemical manufacturer, developing a mathematical model with which to study alternative patterns of deployment of research resources, found useful information in a NASA Technical Support Package.

Subject	Technology Source
A very large Midwest chemical manufacturer	Manned Spacecraft Center
Contact: A Section Supervisor, Process Engineering (responsible for building research equipment and instrumentation)	Tech Brief: 67-10510

Management scientists in this firm were experimenting with a mathematical model of the effects of alternative patterns of resource allocation over a variety of research projects. They found the material in the doctoral dissertation (first brought to their attention via this NASA Tech Brief) a useful input which contributed to their understanding of such modeling processes. The model described in the dissertation was considered to be interesting as a basis of comparison with their work.

The contract referenced above receives Tech Briefs directly. He sometimes refers them to others, known by him to be interested in specific topics.

The generalized comments by this contact about Tech Briefs were:

1. The Tech Briefs he recalled were usually good, brief presentations for the man knowledgeable in the pertinent field.

2. The response to requests for Technical Support Packages was usually timely.

3. The discouraging thing, particularly in a big firm, is getting Tech Briefs to the right people.

He suggested that one of up to 10 or 12 subject categories, each described by a word or phrase, be printed on the head of each Tech Brief

Case Number: 80607026 (Cont.)

so that librarians or other technical personnel could more easily refer them to potentially interested readers.

JSG:bg
9/6/68

Case Number: 80607029

A large East-Central oil company, seeking methodology for programming R & D staffing, reviewed a NASA Technical Support Package in the course of a literature search and analysis project.

Subject	Technology Source
The corporate research and development laboratory of a major East-Central petroleum producer-refiner-distributor	Manned Spacecraft Center Tech Brief: 67-10510
Contact: Manager of central services	

A large oil company obtained and studied a doctoral dissertation described in a NASA Tech Brief. They considered it a usable input to their effort in developing manpower programming methodology for their R & D operations. However, the undertaking was later dropped and a management consulting form was employed to set up a manpower programming system for the entire corporation.

The firm's library receives Tech Briefs and the library staff screens them and routes them to interested people, as it does other publications. In this case, the Tech Brief was routed to the manager of central services (who supervises the library), and he referred it to the management methods section which he knew to be undertaking the manpower programming study.

The contact had no suggestions concerning NASA publications. His evaluative comment was that some have been helpful and some have not.

JSG:bg
9/6/68

Case Number: 80607049

The Atomic Power Division of Westinghouse Electric Corporation has utilized material reference data prepared by Syracuse University Research Institute for Marshall Space Flight Center as an input to an internal design handbook.

Subject	Technology Source
Westinghouse Electric Corporation Atomic Power Divisions Nuclear Fuel Division Penn Center Site, Box 355 Pittsburgh, Pennsylvania 15230 412-256-7000 Contact: Dr. Edward N. Aqua Manager, Structural Materials Development	Marshall Space Flight Center Tech Brief: 67-10282

In an atomic power installation, the fuel rods must be held in very accurate position within the reactor. The positioning is done by a metal grid and materials used by Westinghouse Electric Corporation for these grids include Inconel 718.

In order to insure proper design practice and uniformity of material source data, Westinghouse Electric's Atomic Power Division has published an internal document concerning the design use of Inconel Alloy 718. This document will govern the design of reactor grids as well as other Inconel 718 uses.

As source data for this internal document, Westinghouse relied on the NASA Handbook on 718, the Defense Metal's Information Center (DMIC) report on Inconel 718 (prepared by Battelle Memorial Institute), reference data collected internally be Westinghouse, and various suppliers of the Alloy. Dr. Aqua, who supervised the preparation of the design manual, was unable to estimate the percentage contribution the NASA manual made. This was especially difficult because the DMIC document also references the NASA Handbook. Radiation data for 718 came primarily from internal Westinghouse sources. The finished document is considered to be proprietary information.

Case Number: 80607049 (Cont.)

Preparation of the document involved participation by five engineers in Dr. Aqua's group plus Dr. Aqua's time in proofing and review of the document. Westinghouse is a regular receiver of NASA Technical Briefs and Dr. Aqua receives a regular distribution of these through the Westinghouse library system. He stated that he usually finds 3 or 4 items among various groups of Tech Briefs he receives that prompt him to send away for more information. He finds the general quality of NASA Technical Support Packages to be good.

ROM:bg
8/26/68

Case Number: 80607143

An Associate in Pharmacology of the College of Physicians and Surgeons, Columbia University, has constructed a prototype miniature electrometer preamplifier. He is currently using it in making microelectrode recordings.

Subject	Technology Source
Department of Pharmacology College of Physicians and Surgeons Columbia University New York, New York 10032 212-579-3572 Contact: Samuel M. Ross Associate In Pharmacology	Ames Research Center Tech Brief: 66-10549

The miniature electrometer preamplifier is currently being used in obtaining bio-medical microelectrode recordings. The Department of Pharmacology conducts bio-medical research continuously in order to advance state-of-the-art knowledge in the field of medicine.
Samuel M. Ross, an Associate in Pharmacology, brought the above NASA information to his colleagues attention after having received the Brief while on the NASA mailing list. One of these colleagues has worked with Mr. Ross in the above application.

Initial interest in the information was aroused through Mr. Ross' attempt to develop a "poor man's" microelectric monitoring system for bio-medical research applications. Mr. Ross defined "poor man's" microelectric monitoring system as costing in the area of $3,000 in comparison to commercially available set-ups costing approximately $10,000. He stated that after having reviewed the specifications, he believed that the miniature electrometer preamplifier had potential for incorporation into his "poor man" microelectric monitoring system.

One miniature electrometer preamplifier has been fabricated. It cost between $50 and $75 in comparison to commercially available units costing $500 to $600. Definite savings in development expenditures have accrued, however, little or no time savings occurred since time was lost in an attempt to obtain the specified transistors due to their values having been omitted.

Case Number: 80607143 (Cont.)

Mr. Ross has since been deleted from the Tech Brief mailing list without knowing why. Prior to this situation, he personally screened, indexed, filed, and disseminated information of interest to him and his colleagues. He found only few Briefs with applicability in his field. He did, however, express the point of view that though the number of Briefs having personal applicability is limited, there is much information of interest contained in them. He expressed a desire to once again become a regular recipient of NASA Tech Briefs.

DRL:bp
10/7/68

Case Number: 80607150

An interest in the electrical properties of cellular membranes by bio-scientists at the University of Washington's School of Medicine, Department of Physiology and Bio-Physics, has resulted in the use of an Ames developed negative capacitance preamplifier in conjunction with intracellular microelectrodes. The apparatus is being used for the purpose of recording bioelectric potentials. It has been learned that this particular circuitry is actually a variation of a design that was previously in use, but the results of the use of this variation have been termed as being reasonably satisfactory.

Subject	Technology Source
University of Washington School of Medicine Department of Physiology and Bio-Physics Medical Electronics Laboratory Seattle, Washington 98105 206-543-8639 Contact: Edmund H. Brand, Research Instructor	Ames Research Center Tech Brief: 66-10549

There has been a continuing interest in the electrical properties of cellular membranes at the University of Washington's School of Medicine over approximately the last 15 years. This current interest has been stimulated by the availability of the NASA developed circuitry described in Tech Brief 66-10549. Edmund H. Brand, our contact, is assigned to the Medical Electronics Laboratory as a Research Instructor. He believes that this particular circuitry will enhance current research " . . . if the Mosfet specified becomes more readily available and less subject to fatal damage during general use." His primary concern was the lack of identification of the manufacturer of the specified Mosfet. About 40 hours were spent finding the manufacturer. In addition to these 40 manhours of laboratory technician time, an expenditure of between $50 and $100 was necessary in purchasing the appropriate components.

Mr. Brand made his initial contact with the Ames developed miniature electrometer preamplifier while reading an article published in Electronic Design News which specifically referenced the circuitry.

Case Number: 80607150 (Cont.)

His interest in this particular innovation was motivated by both general interest and specific need. There has always been a great need for this type of circuitry since the initial beginnings of cellular membrane research. By the same token, current research being conducted in this area also stimulated the specific need for such circuitry. When asked whether there were alternative sources of information, Mr. Brand stated that there were a number of alternative sources in the area of biomedical publications. However, NASA's circuitry was the first that he had found with such small dimensions.

Mr. Brand thought that definite savings in development time and money would have accrued had there not been a delay of several weeks in finding sources of supply for the specified components. It was his feeling that this time delay negated any such savings.

Mr. Brand suggested that " . . . where exotic or critical components are specified . . . alternates and their manufacturers should be listed plus suggested precautions, techniques, etc., for avoiding fatal damage to these components. Mosfets in the hands of the general investigator so far has proven impractical in our experience." He pointed out that the majority of the causes of damage to the Mosfets is due to voltage overload. He stated that the specified components were not available in Seattle, thereby requiring direct ordering from the manufacturer. Another suggestion made by Mr. Brand was that NASA should promote its available information through the trade press and professional journals in order to maximize its utilization.

It was learned from Mr. Brand that the School of Medicine does not receive NASA publications on a regular basis and he knows of no intention to do so. All requests are made on an individual basis, usually resulting from literature searches or reading in the trade press and professional journals.

DRL:bg
8/21/68

Case Number: 80607213

The Department of Biology of the Massachusetts Institute of Technology (MIT) is currently making use of four NASA developed miniature electrometer preamplifiers in modified form. They are used to obtain microelectrode recordings in biological research.

Subject	Technology Source
Department of Biology Massachusetts Institute of Technology Building 56, Room 539 Cambridge, Massachusetts 02139 617-864-6950 Contact: Dr. Joel E. Brown, Ph.D. Associate Professor of Biology	Ames Research Center Tech Brief: 66-10549

Four miniature electrometer preamplifiers are being used in MIT biological research where it is necessary to obtain recordings of bioelectric potentials by using intra-cellular microelectrodes. Prior to this application, it was necessary for Dr. Joel E. Brown to contact the inventors in order to obtain component values for a number of specified transistors. Once this information was obtained, minor modifications were made to the original circuitry. Four modified units are now in service. Modified units have proven to be ". . . quite good."

Dr. Brown believes that the NASA information portrays ". . . state-of-the-art design . . .", and therefore has enabled developmental savings in both time and money. He stated that "commercially available units cost $350 to $500" where the NASA developed units cost approximately $50, ". . . $40 for components and $10 to $12 for modifications."

Dr. Brown's initial interest in the Ames innovation was from an excerpt of the Tech Brief published in Medical Electronic News. He ordered the Tech Brief and Technical Support Package which fit his general interest in the area of microelectrode recordings for biological research. A number of designs were available for similar units, including original designs made by a colleague, however, he was seeking an improved unit over those presently in use.

Case Number: 80607213 (Cont.)

This particular Brief is the only one that Dr. Brown has used. He mentioned that MIT's main library does receive them, and if the need arises he can make use of them. He does not plan to become a regular recipient of NASA Tech Briefs because of the poor indexing system currently in use. He stated that a ". . . good index . . . " was needed in order to facilitate review efforts conducted by research personnel. A second complaint was that if Briefs dealing with circuitry do not give component values then they ". . . might as well not publish the circuits . . . ."

DRL:bp
10/7/68

Case Number: 80607427-07428

The Aerospace Group, Boeing Company, Seattle, Washington is currently preparing to market a portable instrument for measuring micro-ohms. Various elements of this instrument's circuitry have been adapted from an Ames developed innovation. The amplifier and filter used in the Ames developed subminiature biotelemetry unit were directly adaptable to the new Boeing product. A second device developed at Ames, a miniature bioelectric device which measures and telemeters temperature, is also under consideration for commercial application.

Subject	Technology Source
Boeing Company Aerospace Group P.O. Box 3707 Seattle, Washington 98124 206-654-6812 Contact: Alfred Pletz, Research Engineer, Aerospace Group	Ames Research Center Tech Briefs: 67-10171 66-10057

The Aerospace Group of the Boeing Company, Seattle, Washington, has adapted certain portions of an Ames developed subminiature biotelemetry unit which permits remote physiological investigations. Mr. Pletz, a Boeing research engineer was assigned the project of developing a unit to measure micro-ohms, with ability to detect small signals. Upon requesting and reviewing the Technical Support Packages, he decided to use the filter and amplifier circuitry referenced in the information. The circuitry was directly adaptable for purposes of filtering and measuring micro-ohms and facilitated the development of the small portable instrument currently tabbed for marketing.

Estimated sales figures are not available, but Mr. Pletz stated that Boeing itself needs 6 or 7 of the units. He believes that this instrument has applicability in many aerospace uses. Each unit is to sell in the range of $400 to $500. In light of the number of firms in the aerospace industry, Mr. Pletz feels that the sales potential for this instrument is very high. The only costs available from Mr. Pletz were $12.00 for components and one or two manhours to adapt the amplifier and filter used in the instrument. These costs are strictly related to the application of the NASA developed circuitry used in the instrument. They do not include total development costs of the portable micro-ohm measuring instrument.

Case Number: 80607427-07428 (Cont.)

Mr. Pletz was very pleased with the information he received. He believes that there were significant savings in both development time and money resulting from the use of this information since it gave him a starting point from which to work. However, this information was only brought to his attention after 16 hours had been spent conducting a literature search. He also thinks that the Ames developed circuitry has facilitated production efficiency, since no design work was necessary for the amplifier and filter.

Mr. Pletz's inquiry was motivated by defined need. He was assigned the specific task of developing a portable instrument for measuring micro-ohms. He knew of no other sources from which he could have obtained the particular circuitry ideas. He was the only individual involved in the development of the portable instruments.

Boeing receives NASA publications on a regular basis. The technical library disseminates these publications to the appropriate sections. The secretaries with the various departments and sections then disseminate the publications to the individuals having an interest in a particular topic.

Mr. Pletz feels that the information contained in the Tech Brief Program is " . . . very thorough . . ." and " . . . very satisfactory." His major suggestion for improvement deals with those Briefs concerned with circuitry. He thinks that all schematics should show component values, thereby speeding up the reviewing and development process.

DRL:bg
8/16/68

Case Number: 80607573-5

Three Tech Briefs and their related Technical Support Packages are being used for welding course background material at The Pennsylvania State University.

Subject	Technology Source
Industrial Engineering College of Engineering The Pennsylvania State University University Park, Pennsylvania 16802 814-865-7601 Contact: C. A. Ellsworth Assistant Professor	Marshall Space Flight Center Tech Briefs: 66-10513 66-10354 67-10177

An Assistant Professor of Industrial Engineering at The Pennsylvania State University noticed three interesting Tech Brief titles in a December 1967 issue of Welding Design Fabrication, and he requested the supporting material. The ideas were developed under contract to NASA by North American Aviation, Inc. and the former Douglas Aircraft Company.

The information serves as background material for the instructor in two industrial engineering courses. The first course is a one semester credit welding familiarization course for sophomores with 75 to 100 students attending each academic year. The second course is more advanced on the junior level with students from both the College of Engineering and the Department of Materials Sciences. The junior level course normally has eight to ten students during a semester and is taught once each academic year.

Mr. Ellsworth observed that he thought this type of information from NASA was filling a void in the literature. He stated that the reason for this was that new techniques were being employed with unusual materials. Nevertheless, the information serves as general background material rather than for a specific application or to aid in the solution of a defined problem.

In addition to those Tech Briefs which might be identified through the business press, there is a standard routing of a list of Tech Briefs

Case Number: 80607573-5 (Cont.)

within the College of Engineering. Faculty members select those that appear interesting from the list for requesting more detailed information.

TDB:bp
10/4/68

Case Number: 80607629

Creare, Inc., Hanover, N.H., an R & D consulting firm, recently developed a fluid logic control system for a client. A literature review conducted by Sperry-Rand for NASA was used for the project.

Subject	Technology Source
Creare, Inc. P.O. Box 71 Hanover, N.H. 03755 603-643-3800 Contact: P. W. Runstadtler, Jr. Director, Fluid Dynamics	Marshall Space Flight Center Tech Brief: 67-10438

Creare, Inc., is an R & D consulting firm about six years old. It has a staff of 18 people, six of whom are Ph.D. level professionals. Peter W. Runstadtler, Jr., Director of Fluid Dynamics, reported that he used the Technical Support Package (TSP) for Tech Brief 67-10438 "Review of Research and Development in Fluid Logic Elements" as one of many information inputs for the project. The result of the project was a fully-developed fluid logic control system for an industrial firm.

The NASA document provided a variety of useful background information, even though only one graph was used directly for development of the control system.

TSP review required about four hours, and Mr. Runstadtler estimated that use of the document saved about two days' development time. He ordered the TSP as a matter of general interest in the fluid dynamics field. The TSP supplemented information acquired from textbooks and papers from the American Society of Mechanical Engineers.

Creare, Inc., is a Tech Brief subscriber. The documents are filed in the company library after one of the professional staff members routes them to interested parties.

Case Number: 80607629 (Cont.)

Mr. Runstadtler has used several TSP's. He stated that he "is happy with them," although he thought they could be improved by including more extensive bibliographies.

WH:bg
10/18/68

Case Number: 80607728

National Forge Company, Irvine, Pennsylvania, is experimenting with NASA developed circuitry to measure capacitive and inductive reactance.

Subject	Technology Source
National Forge Company Irvine, Pennsylvania 16329 814-563-7522 Contact: D. D. Dalrymple Senior Development Engineer	Marshall Space Flight Center Tech Brief: 67-10513

Experiments are being conducted at National Forge Company to improve thermal fatigue testing of various steels and to develop a process for high frequency induction hardening. If the experimental program is successful, the company will utilize the results to improve production efficiency.

A circuit developed jointly by personnel from NASA and the University of Alabama Research Institute improves existing instruments for measuring inductive and capacitive reactance. The circuit design is being incorporated into the experimental program of National Forge. Mr. Dalrymple reported that his program is now at the stage of winding a variety of coils which have from one to thirty turns. Coil reactance must be precisely measured in order to determine the proper sizes and number of capacitors to be used in associated circuitry. The NASA circuit enables him to make the measurements.

Mr. Dalrymple estimated that the project would cost at least $5,000. He estimated that it would cost several thousand dollars more if he did not have the NASA information.

Five staff members use the Tech Briefs to which Mr. Dalrymple subscribes. Two of these are research scientists and the other three are production or design engineers.

Dalrymple has used several Tech Briefs and Technical Support Packages. He has usually ordered the TSP's to satisfy a general interest. This was the situation with Tech Brief 67-10513. He commented that his general interest in this document very soon became clearly focused on a potentially fruitful application in his experimental work.

Case Number: 80607728 (Cont.)

Mr. Dalrymple was "well satisfied" with the Tech Brief system. He characterized it as "a good means of getting out some very useful information."

WH:bg
9/24/68

Case Number: 80607771

Lake Shore Incorporated, of Iron Mountain, Michigan, has applied the concept of comparison of reliability of alternate mechanical designs to subcontracts for the engineering and production of winches used onboard large ships. This innovation was developed by F. W. Henning at Westinghouse Astronuclear.

Subject	Technology Source
Lake Shore, Incorporated Iron Mountain, Michigan 49801 906-774-1500 Contact: Albert M. Baciak Reliability/Maintainability Manager	Space Nuclear Propulsion Office Tech Brief: 67-10261

Lake Shore, Inc. is a manufacturer of conveyors, mining equipment, cargo handling equipment, and related items. It has 550 employees. Recently the company was engaged in sub-contracting work for Litton Industries (the ship building subsidiary in Pasagoula, Mississippi) and General Dynamics. Lake Shore supplied winch systems consisting of gear assemblies, motors, brakes, etc. As a part of these sub-contracts, it was necessary for Lake Shore to provide data to the prime contractors on winch systems reliability/maintainability.

Mr. Albert Baciak had previously worked for Cooke Electric and was generally familiar with the concepts available to measure the reliability of mechanical systems. The AEC-NASA Tech Brief describing the failure rate index was forwarded to Mr. Baciak after he left Cooke Electric and arrived at an opportune time. Baciak said that the primary value of the failure rate index description was that it gave him some idea of what his own reliability/maintainability data and presentation should look like. Baciak said that the major problem with the Tech Brief was that it did not include any data and the primary problem in reliability/maintainability questions is the need to generate original data. Furthermore, the Tech Brief did not offer much guidance in how to obtain the figures when they are not available from manufacturers or other sources.

The winch system was designed and built by Lake Shore, Inc., averaging 500 engineering hours per model (according to Baciak, there are six

Case Number: 80607771 (Cont.)

different models with the number of systems of each model produced). Baciak, himself, spent approximately four hours evaluating the system and an additional 30 to 40 hours in applying the system to the situation faced by Lake Shore, Inc.

DCC:bg
9/11/68

Case Number: 80707841

Cook Paint and Varnish Co., Kansas City, Missouri is using AEC-NASA information concerning the use of borax in polyesters to improve fire-retarded qualities. The information is valuable to the company primarily for general reference purposes.

Subject	Technology Source
Cook Paint and Varnish Co. P. O. Box 389 Kansas City, Missouri 64141 816-471-4800 Contact: Larry Chirpich Research Chemist	Argonne National Laboratory Tech Brief: 67-10016

Argonne National Laboratory scientists developed a method to enhance the fire-retardant qualities of polyesters. Diffusion of borax in the plastic also eliminates generation of black, sooty smoke when the heightened fire-resistance threshold is surpassed.

Larry Chirpich, a research chemist in the Polyester Research Section of Cook Paint and Varnish Co., reviewed the Technical Support Package describing the process for about four hours. It was decided that the invention was not directly applicable to the company's products. The information is now used mainly for general reference purposes. In addition, the invention has been brought to the attention of several customers whose requirements for fire-resistant plastics might make the information valuable to them. The Cook Paint and Varnish Company specializes in coatings and reinforced fiberglass products such as radomes, automobile bodies, and boats, for which the invention has little utility.

Mr. Chirpich's interest in the invention was general, although he anticipated that it might be useful to several customers who were having problems with smoke from conventional plastics. He thought that the borax impregnation process was unique. He had previously learned from a supplier that borax has been used to improve fire retardance and to add fungicide properties to plastics used in salt water with high algae content.

This company does not regularly receive Tech Briefs. Mr. Chirpich became aware of this Tech Brief through a note in a business press

Case Number: 80707841 (Cont.)

publication. He has used only this one Tech Brief, but he thought that several other research personnel in the company had used documents pertaining to cryogenic inventions and coatings technology.

WH:bp
10/7/68

Case Number: 80707862

A small West Coast plastics firm is experimenting with an AEC process which improves polyester fire retardance.

Subject	Technology Source
A small West Coast plastics manufacturer	Argonne National Laboratory
Contact: Manager	Tech Brief: 67-10016

Argonne National Laboratory scientists developed a process which improves the fire-retardant characteristics of polyesters. The technique involves dispersion of borax throughout the plastic. The borax improves fire retardance and eliminates black, sooty smoke in the event that the plastic catches fire.

A small Pacific Coast plastics firm is developing a heat shield for induction furnaces used in aluminum smelting. It must withstand temperatures as high as 600 degrees F. Previous experiments had involved dispersion of antomonium oxide in the plastic but this material did not provide sufficient heat resistance. Current experiments are using borax but the technique has not been successful. For example, a shield fabricated with the borax dispersion began to delaminate at 300 degrees. The manager of the plastics firm thought that they might have used a poor resin or that it was not "wet out enough." Another shield built with a different resin is now being tested at the smelter of the contractor.

The manager could not give a precise estimate of the sales volume that could be expected if the technique were perfected and put on the market. However, he stated that every smelter in the country would be a potential customer and sales could reach "many hundreds of thousands of dollars." He added if the experiments are successful, they will open the door to a "new era" in plastics technology.

This company has devoted over 200 man hours to the heat-shield project. Almost all have been concerned with the borax process. Savings in development time were not yet estimable because the project has not been completed. The manager thought that it might be possible to estimate savings from availability of the AEC-NASA information only after the project is successfully completed.

Case Number: 80707862 (Cont.)

This company has used only one Tech Brief, which was requested after the manager became aware of it through Plastics Technology Magazine. Only the manager and the owner of the firm have used the information since the other ten employees are not technically skilled workers.

WH:bp
10/4/68

Case Number: 80707908

A major aerospace contractor is using a coaxial cable winding for transformers which will be included as components for proprietary devices being produced for an aerospace contract.

Subject	Technology Source
Major aerospace contractor	Argonne National Laboratory
	Tech Brief: 66-10600

Mr. P. DeParry, Argonne National Laboratories, developed a high frequency wide-band transformer with a high turn ratio, flat response, and a high coupling coefficient. Previous state-of-the-art precluded simultaneous achievement of all three characteristics. DeParry's concept solves the problem by using a coaxial cable for the transformer winding, with the inner conductor of the cable functioning as the primary winding and the outer shield as the secondary winding.

An engineer employed by a major aerospace contractor had been working for some time on the problem of developing a transformer with the characteristics achievable with the coaxial winding technique. A friend gave him Tech Brief 66-10600, but he was reluctant to use it because he was confident that he was on the verge of a solution. He would have preferred finding his own solution as a matter of personal pride.

He read the Tech Brief and the simplicity and attractiveness of the coaxial cable solution impressed him. He incorporated the idea of using the coaxial cable and the company has expended about 100 hours during its program to adapt the innovation. The transformer design is considered proprietary, and no estimates of sales revenue were given. Development time savings were impossible to isolate because the AEC-NASA innovation was but one of many technology inputs.

The engineer stated that the only valuable aspect of the Tech Brief was the idea to use coaxial cable for the windings. He estimated that he would have solved the problem within two weeks merely by following his own plan of research. He also speculated that his solution would have involved use of coaxial cable. He plans to write an article about the design problems and several alternative solutions.

Case Number: 80707908 (Cont.)

This company does not receive Tech Briefs, but the engineer expressed a desire to begin a subscription. Although he had used only one Tech Brief, he offered some comments which might be applicable to others. He rated the completeness of the Tech Brief as "fair" because he considered it to be too brief. Specifically, he suggested that it would have been more adequate had it included graphs depicting bandpass characteristics and db per octave rolloff at both high and low frequencies.

WH:bg
9/23/68

Case Number: 80608386

A large division (3,000 employees) of an international firm was able to make a marginal change in its inventory control system based on a computer program write-up.

Subject	Technology Source
A California division of an electronics manufacturer	Space Nuclear Propulsion Office
Contact: Supervisor Engineering Services	Tech Brief: 67-10348

As part of a continuing concern with inventory control, the company librarian abstracted a publication describing a computer approach for a parts-list system designed to coordinate engineering releases, parts control, and manufacturing planning.

The Technical Support Package showed a method to improve the existing decoding operation, used in determining the requisite parts in sub-assemblies, are required in near-term, manufacturing. Overseas affiliates routinely release their manufacturing plans to the California Division. In turn, the California inventory control operation is able to advise the overseas manufacturing division whether required component parts are in stock or whether the parts should be purchased or built.

The engineering supervisor was unable to estimate a dollar value associated with the change. However, he did observe that a few dollars postage for mailing components is substantially less than the typical $4,000 or $5,000 tooling-up effort required to manufacture a part.

JJR:mc
10/14/68

Case Number: 80708390

The Man Saver Division of American Chain and Cable Corporation has manufactured and sold a material handling device originally developed by the Atomic Energy Commission's Argonne National Laboratory.

Subject	Technology Source
American Chain and Cable Corp. Man Saver Division 1110 East Princess Street York, Pennsylvania 17405 717-843-1523 Contact: Mr. D. J. Moro Design Department	Argonne National Laboratory Tech Brief: 66-10522

The Man Saver Division of American Chain and Cable manufactures grabs and hooks for material handling. These devices are used mainly on cranes and other like devices. The principal production of the company is represented by special order devices and no standard inventory is stocked. The company estimates it builds approximately 600 different types of material handling devices.

Mr. Moro noted in a trade publication the self releasing grapple developed by Argonne National Laboratories. This grapple is designed to be used to lift loads equipped with a pre-attached mating pin and to automatically release the load when tension is released from the lifting cable. The device appeared useful to Mr. Moro, and he requested supporting information from Argonne.

The information proved to be useful and triggered several thoughts on similar devices as well as allowing Mr. Moro to meet the requirements of a customer who at that time needed this type of a special device.

The Man Saver Division expended approximately 60 man hours of engineering time plus building and testing a prototype model of the device prior to production. Sales have totaled approximately 11 self releasing units plus 70 mating pins. The company is in the process of further design modification to enable a positive locking feature to be attached. Mr. Moro was unable to provide sales price figures.

Case Number: 80708390 (Cont.)

American Chain and Cable Company headquarters regularly receives Tech Briefs. This Brief was routed to Mr. Moro several days after he had noticed it in a trade press publication. This is Mr. Moro's first experience with AEC information, but he thought the information received in this situation was well prepared and quite complete.

ROM:bp
10/1/68

Case Number: 80608537

A methods engineer was able to reduce training time and gain acceptance for some numerical control machine tools by using a pocket-sized manual tape reader.

Subject	Technology Source
Diebold, Inc. Canton, Ohio 216-453-4592 Contact: Mr. Duane Houk Methods Engineer	Kennedy Space Center Tech Brief: 67-10361

This 108-year-old company manufactures safes, vaults, power files, and banking information retrieval systems. Several years ago they had purchased two numerical controlled tape drills. However, the drills never have been fully utilized in the expected way since they were being operated as manual drills.

Mr. Houk was given the task of increasing the production of these drills. He reasoned that part of the problem lay in the distrust and lack of acceptance of paper tape. (It is difficult to read the holes in paper tape.) He noticed an article in a trade magazine, Machinery, describing a Tech Brief on a pocket-sized paper tape reader. He acquired the Technical Support Package and had five of these paper tape readers built in-house at a cost of about $50 each.

With the use of these paper tape readers, Mr. Houk conducted training courses on paper tape for machine operators, tape punchers, programmers, and managers. Mr. Houk thinks the increased understanding of paper tape coding has been instrumental in the recently increased productivity of the two numerically controlled drills.

A third drill has been ordered as well as an $89,000 tape controlled turret punch press. Both of these items have not had to undergo the normal justification study due to the results now being obtained from the original tape controlled drills. Mr. Houk further estimated that perhaps 200 hours of training time had been saved by using this paper tape reader.

JJR:bp
10/15/68

Case Number: 80608591

A small New York coatings manufacturer is marketing an inorganic paint. A NASA Technical Support Package was reviewed during the development program, but the final product is unique. A patent is pending.

Subject	Technology Source
Chanden Coatings, Inc. 1800 Broadway Buffalo, New York 14212 716-896-0418 Contact: W. H. Paul Research Chemist	Goddard Space Flight Center Tech Brief: 65-10156

Chanden Coatings, Inc., a small subsidiary of a large corporation with international operations, is selling an inorganic paint to industrial users. The paint's main feature is its ability to protect against corrosion. The product is being marketed under a pending patent, and no NASA license will be sought since its development was company sponsored.

Tech Brief 65-10156 was reviewed by the personnel involved in the development program. However, it was reported that none of the NASA information was used directly for final product specifications. Mr. Paul estimated that 80 percent of the technology involved in producing the product was generated within the company. The other 20 percent came from published sources, vendors, and a patent search. The NASA information was reviewed very late in the development program and contributed nothing to the final result. However, the 40 hours expended for review produced some new ideas for future work.

The company does not receive Tech Briefs. A fellow chemical engineer suggested that Mr. Paul examine Tech Brief 65-10156, and he has used no others. He mentioned that he had received notice that a supplement to the TSP was to be issued but he has not yet received it.

WH:bg
10/20/68

Case Number: 80608610

A small Eastern insulation manufacturer anticipates further development efforts to perfect an inorganic coating for indoor building uses.

Subject	Technology Source
Eastern insulation manufacturer Contact: Director of Research and Development	Goddard Space Flight Center Tech Brief: 65-10156

The January 1968 issue of Silicate P's and Q's, published by the Philadelphia Quartz Company, contained a discussion of the potassium silicate paint formulations developed by J. B. Schutt. The director of Research and Development of a small Eastern insulation manufacturing firm read the article and requested more information about licensed vendors and technical details. He attempted to purchase the coating from a Chicago firm to whom he was referred, but was informed that the firm no longer produced the paint. Consequently, he initiated a development program in his own laboratory.

The objective of this company's development program is to perfect a coating for application on interior surfaces of metal buildings. The company is two steps removed from the final market, since they manufacture fiberglas insulation which is used in conjunction with metal panels. The panels are sold to distributors who in turn sell to builders. The firm anticipates that the inorganic interior coating will augment the fiberglas insulation of the panels as well as provide fireproofing for the fiberglas facing.

Personnel shortages have retarded the development program, and it was impossible to estimate the savings that might result from using the NASA information. About 40 hours have been expended for review of the material and some laboratory work. Test samples have been formulated and they indicate that the formulations will be feasible for the intended use. Marketing personnel are also involved at this stage to determine the market potential for the coating. Since this company is rather remote from the final market, they want some assurance that the product can be successfully marketed to distributors and builders before they allocate a large amount of resources to the development program.

Case Number: 80608610 (Cont.)

Tech Briefs are new to this company. The Research and Development director stated that he had used only this one, and that the company does not regularly receive them.

WH:bg
10/19/68

Case Number: 80708666

The Research Department of the Torrington Company considered a microwave method developed at Ames Research Center when looking for a nondestructive test method for bearings.

Subject	Technology Source
Torrington Company 59 Field Street Torrington, Connecticut 203-482-4441 Contact: George H. Schneider Mechanical Engineering Consultant Research Department	Ames Research Center Tech Brief: 67-10482

The Torrington Company now finds it necessary to destructively test rollers for roller bearings on a sampling basis. This process is not only slow and wasteful, but at times discovers flaws in rollers after they have been incorporated into bearings.

For the past two years, the Company has conducted research with the aim of finding a nondestructive test method able to discover surface flaws on bearing rollers at the production rate of 100 to 200 per minute. These rollers range from 1/8 to 5/8 inch in diameter and from 3/8 to 2 inches long. The flaws generally are the result of seams, overlaps or dirt inclusions in the original steel lot. The steel producers are unable to eliminate these flaws and it remains for Torrington to discover the surface imperfections in the rollers.

In his search for information, Mr. Schneider, a consultant in the Company's Research Department, noticed a NASA Tech Brief describing a microwave method for testing for surface flaws. He ordered the Technical Support Package describing this method and evaluated it against other techniques.

Other methods which have been investigated, or are under investigation, include eddy current, automatic magnafluxing, and ultrasonics. Mr. Schneider now thinks that ultrasonics represent the best hope of discovering a nondestructive test method. He had discounted the microwave method as not being particularly useful in this application.

Case Number: 80708666 (Cont.)

Mr. Schneider also sees no future application for microwave application at the moment. The company has expended approximately $50,000 in its search for a nondestructive test method. However, very little of this was expended in evaluating the microwave test method.

Mr. Schneider personally receives NASA Tech Briefs and said that to his knowledge, the company did not receive them on a regular basis. He utilizes NASA information at times and has found it satisfactory to date. He stated that ". . . when going into a research project a knowledge of what other people are doing narrows the field."

ROM:bp
10/9/68

Case Number: 80708728

Printed Circuits, Inc. may develop a small manual reader for coded punched tapes. A Boeing employee, Felix L. Odle, invented the device while working on a NASA project.

Subject	Technology Source
Printed Circuits, Inc. 7800 Computer Avenue Minneapolis, Minnesota 55435 612-927-5681 Contact: Peter T. Millunzi Sales Manager	Kennedy Space Center Tech Brief: 67-10361

The marketing staff of Printed Circuits, Inc. is evaluating a proposal to develop a pocket-size manual punched tape reader. They have not yet decided on a specific marketing goal and have not assembled a production team to design and construct the device. Peter Millunzi, Sales Manager, ordered the Technical Support Package because the Tech Brief aroused his interest in the device's potential as a new product or as a promotional tool. About four hours have been expended for the evaluation.

When a decision is made regarding the best utilization of the idea, Mr. Millunzi anticipates that the firm will be able to produce the device almost entirely with internal technology. The primary value of the NASA document was to suggest the device idea.

The company has an unusually fruitful arrangement for reviewing and using NASA Technology. Mr. Millunzi reviews all incoming Tech Briefs for marketable ideas. Because of his own technical background he has been able to communicate readily with members of the technical staff. The communication process was recently enhanced by a reorganization which brought in a new research and development supervisor. He works closely with Millunzi in evaluating new ideas and initiating R & D projects to develop those which appear to be fruitful. The president also participates actively in new technology acquisition, thereby increasing the probability that new ideas will be thoroughly reviewed and evaluated. According to Mr. Millunzi there are few remaining internal barriers to the company's acquisition of new technology or development of new products.

Case Number: 80708728 (Cont.)

Mr. Millunzi acquired the responsibility for Tech Brief review because the technical staff had less time and interest. His technical background qualified him for the review task, and he accepted it without hesitation because he was convinced that Tech Briefs were a good source of marketable ideas and improved process technology.

Although the company has a Tech Brief subscription, some internal problems have occurred in the matter of maintaining access to the documents. Mr. Millunzi routes each Tech Brief to personnel who are interested in the specific subject and they return them to a central file if no immediate use is contemplated. Subsequent retrieval of the information depends largely upon Mr. Millunzi's memory, as no formal indexing system has been established. Millunzi intends to order a Cumulative Index to NASA Tech Briefs to aid him in overcoming this problem.

Mr. Millunzi commented that the Tech Brief format accomplishes what he believes it should. It presents information sufficient to make a decision as to interest in the idea. He stated further that greater length and more abundant detail would detract from their usefulness since he would have to spend more time reviewing them before he could make a decision.

WH:bp
9/25/68

Case Number: 80709002

Maury Microwave Corporation of Montclair, California manufactures and markets two devices first developed at NASA's Jet Propulsion Laboratory.

Subject	Technology Source
Maury Microwave Corporation 10373 Mills Avenue Montclair, California 91763 714-626-0441 Contact: M. A. Maury, Jr. President	NASA owned Patent # 3, 277, 366 JPL IR 30-528

Maury Microwave Corporation is a small manufacturer of components used in the microwave field. The company employs approximately twenty people, and its principal customers are governmental agencies and semigovernmental or public utilities bodies such as COMSAT.

Starting in 1962, Maury Microwave has held contracts with Jet Propulsion Laboratory for the development and manufacture of pieces of microwave equipment. The first of these contracts was for work on a cryogenic termination. This device is otherwise known as a "cold noise source" and provides an accurately known input noise temperature for use in measurement and calibration of microwave equipment.

Further developing the state-of-the-art with company funds from the start achieved under NASA contract, Maury has developed sales of the cryogenic noise source which are approximately ten percent of the total company sales. The basic advantage of the Maury cryogenic termination is said to be its superior accuracy when compared with other devices designed to perform the same function. Mr. Maury stated in a personal interview that, although there was no extensive requirement for this great accuracy at this time, his opinion was that, as the microwave field further develops, there would be more demand for instruments with superior accuracy.

Important to the development of an accurate cryogenic termination is the development of a test instrument with which to calibrate the cryogenic termination. Based on innovations by Mr. Stelzried of JPL, which are protected by NASA owned patents, Maury has commercially developed an Insertion Loss Test Set. This set allows very accurate measurement

Case Number: 80709002 (Cont.)

of losses due to insertion of a microwave component into a given circuit. Among its other uses is the accurate calibration of cryogenic terminations. Commencing work on this device in late 1963, Maury had a fully developed and workable unit by August of 1964, and commenced marketing efforts in early 1965. More than ten instruments have been sold, and, as with the cryogenic termination, the company expects future sales of insertion loss test sets to be a significant factor in the company's overall sales picture. Besides these two major developments, Maury markets instrumentation which the company found necessary to build to adequately develop and manufacture the insertion loss test set and the cryogenic terminations.

Maury continues under contract to JPL for various tasks, and Mr. Maury envisions further useful secondary impacts from the JPL contacts.

ROM:bg
7/22/68

Case Number: 80709048

Anchor Plating Company of South El Monte, California, attempted to use a plating process for magnesium-lithium alloy which was developed by International Business Machines for Marshall Space Flight Center.

Subject	Technology Source
Anchor Plating Company, Inc. 1734 North Tyler Avenue South El Monte, California, 91733 213-443-3177 Contact: George Vender Secretary-Treasure	Marshall Space Flight Center Tech Brief: 65-10294

Under contract to Marshall Space Flight Center, International Business Machines developed a process to deposit zinc plating on a specific magnesium-lithium alloy. The specific alloy in question was LA-141 (14Li, 1Al, 85Mg). This process allowed plating the material which resists standard plating methods using copper and zinc.

Anchor Plating Company employs approximately 60 people, and specializes in plating to military and space science specifications of electronic components.

The specific job for which Mr. Vender hoped to use the NASA process involved satellite components made of an unknown magnesium-lithium alloy. He attempted to use the process on a test chip of the material and it appeared to work. He followed this with a test on a sample part which also appeared to hold a satisfactory plate. Anchor then attempted to plate some of the production pieces using the NASA process, but found that the pieces were etched badly. Following this failure, the company expended approximately 40 manhours and about $200 worth of plating materials in experimenting with the NASA process. This experimentation consisted of changing ph levels and concentrations of the various solutions and changes in the timing in attempts to eliminate the etching. When Mr. Vender felt that he had exhausted the various process possibilities of the NASA information, he developed a proprietary plating process with which Anchor was able to plate the production parts. Vender was unable to state whether the NASA process was at fault or the alloy, since neither Anchor nor the personnel at the installation from which the parts came were able to state with certainty the alloy composition.

Case Number: 80709048 (Cont.)

Anchor does not regularly receive Tech Briefs, and Mr. Vender was unable to state how this particular Tech Brief had first come to Anchor's notice. He found the information clear, but in this particular case, the process was unsuccessful.

ROM:bp
10/14/68

Case Number: 80709118

Development engineers employed by a major electronics firm have reviewed a NASA Technical Support Package (TSP) which deals with silicon integrated circuits. The TSP was written by Westinghouse employees under NASA contract.

Subject	Technology Source
Major electronics firm Contact: Development Engineer	Marshall Space Flight Center Tech Brief: 67-10335

Intermetallic contacts in silicon integrated circuits are subject to degradation of bond strength when fabricated by conventional techniques. Westinghouse engineers invented a fabrication process which lessens the problem, and NASA published the relevant information in Tech Brief 67-10335 and its Technical Support Package.

A development engineer with another major electronics firm ordered the TSP for background material in a project to develop new capacitor designs. He stated that his work involves only "passive" electronic elements, but that knowledge of "active" circuits is required for complete background. His interest in the TSP stemmed from a need to acquire as much advanced information as possible about "active" circuitry. Since bonding to very thin (.001 in.) aluminum is a serious problem in "active" circuit fabrication, he ordered this TSP, which deals with the problem. He stated that the document contributed "negative" knowledge; it showed that no one had yet solved the problems with which he was concerned.

He reviewed the TSP for about two hours and filed it. Since the TSP provided only "negative" information he could not specify any savings associated with its use. Nevertheless, he characterized it as "very satisfactory."

This firm is a regular subscriber to Tech Briefs. The library circulates a list of all recently published Tech Briefs and technical papers generated within the company. Personnel who desire more extensive information return a request card to the library. Almost all recipients of the publications list are research and development personnel.

WH:bp
10/3/68

Case Number: 80609267

The Bay State Abrasives Division of Avco Corporation will consider a plastic developed for NASA's Lewis Research Center as a possible high temperature resin binder for its abrasive products.

Subject	Technology Source
Avco Corporation Bay State Abrasives Division Westboro, Massachusetts 01581 617-366-4431 Contact: John R. Thompson Senior Development Engineer Organic Section	Lewis Research Center Tech Brief: 67-10197

Bay State Abrasives Division of Avco Corporation produces abrasives for industrial use. Binders used to bond the abrasives to the various grinding devices range from low temperature lacquers and resins to ceramics and steel for use at high temperatures and speeds. Mr. Thompson, of the Company's Organic Section, is currently engaged in the search for a resin binder which will bridge the gap between the low temperature resins and the high temperature ceramics. In searching the open literature, trade press, and professional journals for information relating to high temperature resins, Mr. Thompson noted a reference to the Hystl resin, developed by TRW Systems for Lewis Research Center.

Efforts then began to procure the Technical Support Package dealing with the plastic. Mr. Thompson stated that ". . . the total time from my first seeing a reference to the package, until I got it, was about six months. It became such a challenge I came close to writing my congressman about it." He characterized the entire process in procuring the Technical Support Package as "frustrating - especially since the information appeared so pertinent to the project."

Having once received the Technical Support Package, he found that the information was excellent and well presented. Besides the information directly relating to the plastic, he found many techniques and subsidiary ideas and processes were presented which he will be able to use in the present search for a high temperature resin and in his future work.

Case Number: 80609267 (Cont.)

The project to find a high temperature binder is just underway and very little expenditure has been made to date on Hystl or other binders. Mr. Thompson's primary interest is in finding a commercially available product rather than in formulating a plastic which Avco would produce.

He stated that his goals at the present were performance oriented rather than cost oriented, and that this would govern the search for materials at the moment.

This was Mr. Thompson's first use of NASA information, and despite his frustration with the long time delay in receiving information, he intends to pursue pertinent NASA information in the future.

ROM:bg
9/30/68

Case Number: 80709657

A midwestern temperature regulator manufacturer is experimenting with DC pin-to-pin testing of integrated circuits. The technique was developed by E. F. Thomas.

Subject	Technology Source
A midwestern electronics firm Contact: Reliability Engineer	Goddard Space Flight Center Tech Brief: 68-10001

Conventional test procedures for integrated circuits do not measure the electrical characteristics of individual circuit elements because the elements are usually inaccessible. Only overall functional tests are feasible, but this type of test does not reveal significant characteristics of the individual elements. An external pin-to-pin testing procedure allows examination of individual element performance, thereby improving reliability of the unit.

A midwestern temperature regulator manufacturer is using pin-to-pin testing in the Product Development Laboratory. The company does not manufacture integrated circuits, but purchases and incorporates them into its own product assemblies. Since the company is increasingly using integrated circuits to make its data logging systems more sophisticated and reliable, it is anticipated that this testing technique will be used extensively. The procedure is currently used only in laboratory work but may be applied for quality control purposes in assembly production.

Laboratory technicians have expended "several hundred" manhours applying the test method. Savings could not be estimated by the reliability engineer who has been in charge of applying the technique. He stated that he "had no practical means of handling the problem before this came along." Therefore, he had no alternative with which he could make comparisons and estimate savings.

This company regularly receives Tech Briefs. They are reviewed by upper-level management personnel who decide which scientists are to receive them. Thus, the reliability engineer noted, he could easily be bypassed in the circulation process and miss some significant information.

Case Number: 80709657 (Cont.)

He has used several Tech Briefs but was reluctant to make a general comment about their quality. He noted that he has been disappointed with at least one document because his expectations were not fulfilled regarding its usefulness.

Company personnel involved in utilizing this information include engineers and laboratory technicians. The technicians required some training in use of the test method but are now thoroughly competent.

WH:mc
10/8/68

Case Number: 80609666

A large plastics manufacturer is using a device to measure peel resistance of laminated vinyl glass. The device was invented by RCA personnel under NASA contract.

Subject	Technology Source
Major plastics manufacturer	Goddard Space Flight Center
	Tech Brief: 65-10173

The strength of adhesive bonds between layers of laminated materials can be tested most accurately by application of a perpendicular peel force to the laminate surface. RCA engineers invented a jig which maintains the laminate in proper position for continuous application of a perpendicular peel force by a standard tensile testing machine.

A major manufacturer of vinyl glass is using the jig for quality control and in research and development projects. A company spokesman stated that "the jig is an excellent tool for testing so long as the material is of uniform quality." He also commented that he had designed an almost identical jig some months ago but was unable to get company approval for its fabrication. However, when the NASA Tech Brief was brought to the attention of his superiors, they immediately contracted with a machine job shop to build the device. The jig has worked so well that engineering drawings have been disseminated to several other branch plants. The spokesman anticipated that several of the devices would be built for use in the branch plants as a result of the successful use in his plant, and diffusion of the information.

The company library subscribes to Tech Briefs and routes them throughout the company. The spokesman estimated that 99 percent of those "who have access to this type of information" perform research and development functions. He has used only one Tech Brief.

WH:bp
10/7/68

Case Number: 80709704

Wah Chang Albany Corporation of Albany, Oregon, is utilizing a non-destructive test method for identifying metals which was developed for NASA's Manned Spacecraft Center.

Subject	Technology Source
Wah Chang Albany A Teledyne Company P. O. Box 460 Albany, Oregon 97321 503-926-4211 Contact: R. T. Webster Manager, Scrap Processing	Manned Spacecraft Center Tech Brief: 66-10305

Wah Chang Albany is a producer of zirconium, columbium and tantilum metals. In zirconium it holds the dominent position in the United States, producing approximately 90 percent.

A major use for zirconium is as a cladding for fuel and nuclear reactors. Zirconium's end uses demand that it be refined and processed to an extremely pure state. This purity is reached in the chemical processing which results in zirconium sponge. Further processing is then metallurgical and the problem is one of preventing impurities from entering the metal during these stages of the processing.

The complete processing cycle creates much scrap which is returned for re-refining and use. Scrap is also received from Wah Chang's customers for reprocessing. While control of internally created scrap is relatively simple, Wah Chang has no control over scrap being returned from customers. This scrap must be sorted and classified for further use. This sorting and classification involves several tests of the scrap metal to determine its content and purity.

Crude methods of determining the type of scrap involve a visible spark method and visual sort. This is then followed by a visible spectroscope test which further determines the alloys included in a given scrap batch.

Further classification of scrap metal previously was dependent upon tests run by the chemistry laboratory. Although Wah Chang has extensive chemical laboratory facilities, these are oriented toward quantitative work and are not set up to do crude test methods of a qualitative nature

Case Number: 80709704 (Cont.)

on batches of scrap metal. This made the testing by the chemistry laboratory expensive, both in terms of time involved and in the use of chemical laboratory facilities which were needed for other jobs.

Mr. Webster noticed in Metals Progress, a publication of the American Society of Metals, reference to a nondestructive test useful for identifying metals. This test method involves measuring the characteristic potential difference between a reference electrode and the test metal. Wah Chang had all the necessary test equipment on hand to utilize this method and no expense was involved other than setting up the method. This approach is now used for identifying scrap metals for reprocessing instead of the former chemistry lab tests, and while Mr. Webster was unable to estimate exact savings, he stated that " . . . there are substantial savings in both time and use of chemistry laboratory facilities."

The company does not receive technical briefs on a regular basis although Mr. Webster is interested in learning more about the NASA Technology Utilization Program. The company maintains an extensive technical library and receives publications such as the Chemical Abstract and Nuclear Abstract. Mr. Webster stated that the NASA information regarding this testing method was good in quality and enabled him to easily set up the test method.

ROM:bp
10/1/68

Case Number: 80709825

Leeds, Hill and Jewett, Inc., San Francisco consulting engineers, evaluated a NASA technique for damping wind-induced oscillation of tall flexible structures. The technique was not used for the contemplated application.

Subject	Technology Source
Leeds, Hill and Jewett, Inc. Consulting Engineers 120 Montgomery Street San Francisco, California 94104 415-718-6100 Contact: Marc S. Caspe Senior Engineer	Langley Research Center Tech Brief: 68-10042

Wilmer H. Reed, III, Langley Research Center, designed a suspended-chain damping device for tall cylindrical antennas. The chains are covered with plastic or rubber sleeves and encased in a neoprene shroud. The cluster is suspended inside the tip of the mast, thereby eliminating requirements for guy wires. In the original NASA application, a 12 pound damper inserted in a 261 pound antenna mast increased damping of the fundamental mode by a factor of 20.

Marc S. Caspe of Leeds, Hill and Jewett, Inc. recently completed a damping design for a water tower, and reviewed the NASA design for possible application. He decided to use another system because of uncertainties about the effectiveness of the NASA design. The intended application involved a vertical standpipe 8 feet in diameter and 90 feet high. During periods when the standpipe is not full and subject to high winds, there is a vibration problem for which damping is required.

Mr. Caspe stated that his firm preferred to use another damping method because it had been proven effective. In contrast, the NASA design involved considerable uncertainty since it would have to be adapted to a type of structure essentially different from the original application. Rather than experiment with an untried method and possibly have to modify or reject it later, they decided to use the proven method.

The NASA ". . . solution is valid and has a definite application," according to Mr. Caspe. The design will be used when the firm encounters a suitable application. Availability of the NASA information

Case Number: 80709825 (Cont.)

involved "definite savings," according to Mr. Caspe, but since he used a different design for the tower it was not possible to specify the magnitude of the savings. About ten hours of review time were devoted to the NASA information.

Mr. Caspe receives a Tech Brief subscription at his home address. He has used several in his work and stated that they have been "quite useful."

WH:bp
10/14/68

Case Number: 80711004

A chemist attempted unsuccessfully to acquire sample materials to use in developing a tungsten alloy.

Subject	Technology Source
A research laboratory of a large conglomerate corporation	Lewis Research Center
Contact: a staff chemist	Tech Brief: 67-10340

The contact in this case is the only chemist in an electro-mechanical group. One of the functions of this group is the fabrication of conventional tungsten. The Tech Brief and Technical Support Package offered a method for increasing the ductility of tungsten. Specifically, it seemed to hold promise for a ten-fold increase in the lifetime of an electron gun filament.

The chemist initially noticed mention of this tungsten alloy development in Design News. After receipt of the Tech Brief and Technical Support Package, he placed a purchase order for the requisite materials for experimentation. The purchasing department, which has sole authority for contacting suppliers, reported to him that they were unable to acquire the requisitioned materials. Further questioning along this line was unproductive. Whether or not the respondent knows the reason for his purchasing department's negative response is not known; he simply declined to elaborate.

JJR:mc
10/14/68

Case Number: 80711027

A college professor used a Tech Brief as an example of good technical writing.

Subject	Technology Source
Department of Design and Industry San Francisco State College San Francisco, California 94132 415-469-1554 Contact. David F. Wentura Professor	Lewis Research Center Tech Brief: 67-10340

Professor Wentura conducts a senior level course, Industrial Communications, in the Department of Design and Industry. He is always searching for examples of good technical writing to use in his classes. He does not recall where he first learned of the subject material, but it may have been in the Cumulative Index of NASA Publications. He considers these brief abstracts in the Cumulative Index to be very well written.

Professor Wentura has never used the information he has received from NASA in a substantive sense. However, he states that he has always been favorably impressed with the materials he receives several times a year.

JJR:mc
10/14/68

Case Number: 80711194

A major electronics manufacturer has adopted a NASA invention in plastics technology. This company is using the thermosetting plastic to provide a protective shield for a transistor module which functions as an immersible oil temperature sensor.

Subject	Technology Source
Major electronics firm Contact: Materials Engineer	Lewis Research Center Tech Brief: 67-10197

Materials engineers employed by a large electronics firm have modified an invention in plastics technology that originated with TRW Systems. This firm's plastic has significant flame retardant characteristics which may have a variety of applications for computer materials. A materials engineer commented that if a fireproof plastic with the hardness properties of steel could be perfected, it might be used for computer skins. Government and Underwriter's Laboratory specifications would have to be satisfied for such an innovation, but the new plastic might prove to be suitable.

The company's first use of the material is a protective covering for an oil temperature sensor. The transistorized instrument is immersed in hot oil to make temperature measurements. The engineers who developed the shield are also responsible for corporate standards specifications, and they anticipate that the plastics innovation will have an impact on many production processes.

About 65 hours have been devoted to development of the protective shield. The program was probably one to two months shorter than it would have been without the NASA information. It is estimated that the value added to the product by this innovation will be on the order of $100,000 for first year sales.

A Materials Engineering article provided the initial awareness of the TRW Systems idea. Since he was working on development of the protective shield, the materials engineer had also contacted conventional information sources such as vendors. He had reviewed several supplier catalogs, but these sources provided limited assistance.

Case Number: 80711194 (Cont.)

This firm's personnel have used many Tech Briefs. Primary users are R & D personnel and engineers, especially those responsible for standards engineering. There is no institutionalized company procedure for regular ordering and circulation of Tech Briefs.

Individual orders are placed as personnel become aware of specific documents through trade press and other information channels. Some technical information has been acquired through special contacts with George C. Marshall Space Flight Center.

The materials engineer's general evaluation of Tech Briefs was that they are "excellently done."

WH:bp
10/3/68

Case Number: 80711259

Capitol City Casket Co., Little Rock, Arkansas is developing a new casket model using thermosetting plastic. A NASA plastic invention developed by TRW Systems was reviewed for usable information.

Subject	Technology Source
Capitol City Casket Company 1222 Garland Avenue Little Rock, Arkansas 72203 501-374-0342 Contact: J. E. Maddox Production Manager	Lewis Research Center Tech Brief: 67-10197

Research and development personnel of the Capitol City Casket Company have designed a new model casket which will be made of thermosetting plastic. The plastic casket concept was stimulated by innovations in the container industry. The novelty of a plastic casket will be its susceptibility to hermetic sealing by forming an interior vacuum. The unit will be molded with an orifice to exhaust the interior air after closing the lid. Some sealers may be necessary, but the vacuum seal is expected to perform the sealing function. Mr. Maddox noted that the sealing function is intended to "keep things inside the casket," contrary to the popular notion that its purpose is to "keep things out." Other advantages of the plastic casket include its ability to withstand temperature extremes without deterioration.

Mr. Maddox expects a significant impact on the casket market if all casket producers enter the plastic unit in their product lines. Because tradition is a very important factor in casket marketing, there may be some difficulty with a new type of casket unless its unique advantages can be marketed. There are currently about 600 casket manufacturers in the country, as compared with 1800 three years ago. Mergers and exits from the industry are occurring at high rates, which may either impede or facilitate idea diffusion.

The potential market for plastic caskets is the middle price range units. About 1,800,000 units were sold last year, and about 1,000,000 were in the middle price range. However, there is an upward trend in sales of the higher-priced units.

Case Number: 80711259 (Cont.)

Production economics of the casket industry will probably preclude significant overall savings as a result of using plastic rather than other materials. Labor costs are an important element of total costs in all price lines. The plastic casket will be in the middle price range and Mr. Maddox anticipates that total costs will remain about the same. Some labor displacement will occur, but the savings will be offset by higher materials cost. If the plastic casket could be tailored for the higher-priced market, there would be a net cost reduction because materials cost increases rapidly as heavier guage metals are used for the more expensive units. Substitution of less costly plastic would achieve net savings in this price range, but no plans are being made to introduce plastic to these product lines.

In addition to the labor cost reduction, some additional saving will result in the finishing process. It will not be necessary to perform considerable finishing of a plastic unit after die forming.

About 40 hours were devoted to review, study and modification of the NASA document. Specifications were drawn up and all the technical material was turned over to a chemical company. The chemical company is under contract to perfect the chemical formulations and forming processes for casket production. Patent conflicts for the plastic material are not anticipated because the chemical company has its own patent for a proprietary plastic. The casket company holds a patent for a fiberglass casket.

Mr. Maddox has used several Tech Briefs which he ordered individually from trade press notices or articles. He commented that Tech Briefs "for the most part have been very good." He also expressed satisfaction with NASA's responses to letter inquiries about plastics, adhesives, and production techniques.

WH:bp
10/3/68

Case Number: 80711411

A high voltage electronics company successfully developed a new tungsten alloy filament for one of its vacuum tubes.

Subject	Technology Source
A high voltage electronic company Contact: Project Manager	Lewis Research Center Tech Brief: 67-10340

In the continuing effort to improve the life expectancy of vacuum tube filaments, a project manager noticed mention of a new rhenium-tungsten alloy in Design Engineering. After receiving the Technical Support Package, experimentation was conducted, and the product is now in production.

The improvement is a better hair pin filament without whiskers. It is able to withstand occasional surges of high voltage, thereby increasing its lifetime.

It is not a high production item, and it was estimated that the cost of development (about 100 hours) will never be recouped from additional sales directly attributable to this product. Nevertheless, this company now has a better product. It also has a new problem; the filament will outlast the rest of the tube.

JJR:mc
10/14/68

Case Number: 80812393-95

A Research Scientist at Boeing's Information Sciences Laboratory is currently involved in an effort to adapt a subminiature biotelemetry unit, developed at Ames, to the task of monitoring intensive care cardiac patients for EKG readings when they are past the bedridden stage.

Subject	Technology Source
Information Science Laboratory Boeing Scientific Research Laboratories The Boeing Company P. O. Box 3981 Seattle, Washington 98124 206-655-8959 Contact: A. Frederick Fath Research Scientist	Ames Research Center Tech Briefs: 64-10171 (information only) 66-10057 66-10624

A group of physicians from a local hospital approached The Boeing Company in hopes of obtaining funding for an experimental EKG monitoring system for critical cardiac patients. Prior to this request, Boeing's goodwill fund, the Good Neighbor Fund, which might normally support this program, had been depleted for the year. However, Boeing did agree to provide clerical and technical support to the project. Mr. A. Frederick Fath, of Boeing, a Research Scientist with an electrical engineering background, has devoted approximately 20 hours of his time to the project. As of this writing it has been determined that the subminiature biotelemetry transmitter referenced in Tech Brief 64-10171 is just the device needed because of its size, adaptability, and cost.

The Whittaker Corporation, which manufactures the transmitter, has been given the job of adapting the transmitter to this use, which it is currently working on. Approximately 70 percent of heart failure deaths occur during the three day critical period immediately following heart failure. During this period the patient is bedridden and monitored constantly. Once this period has passed, the patient is allowed to leave the bed for short periods of time and it is during this time span that approximately 20 percent of heart failure deaths occur. The major emphasis of this project is the use of the subminiature biotelemetry unit in the monitoring of EKG readings during this mobile state.

Case Number: 80812393-95 (Cont.)

A number of other commercially available transmitters have been compared with the NASA developed transmitter, all having been found to be inadequate because of large antennas and size or because of poor reliability. In this respect, Mr. Fath stated that the availability of this particular transmitter has resulted in definite savings in both development time and money, although a specific dollar figure was unavailable.

Mr. Fath's initial contact with the referenced NASA document was through a literature search conducted for the project. During his search he read an article authored by T. B. Fryer, of Ames, in Proceedings of the 17th Conference of Engineering in Medicine and Biology which dealt with the biotelemetry unit. A request for the Brief and its Technical Support Package soon followed.

Boeing's Scientific Research Laboratories received NASA publications through its technical library. These documents are not routed; however, they are available for literature searches.

Mr. Fath's general comments on those documents that he personally has had occasion to work with were that they are ". . . very adequate and extremely complete." One suggestion that he had was that more brief abstract articles should be published in trade journals announcing the availability of NASA information. He thinks that this would greatly expedite the transfer process since he believes that this is a major technique of information acquisition among professional research scientists.

DRL:bp
10/15/68