

REPORT

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PROJECT FOR THE ANALYSIS OF TECHNOLOGY TRANSFER

Quarterly Report Number 2

1 April 1970 - 30 June 1970

Contract NSR 06-004-063

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DENVER RESEARCH INSTITUTE
UNIVERSITY OF DENVER

This report presents the results of three months of research on technology transfer conducted by the Industrial Economics Division of the University of Denver Research Institute (DRI). Material presented in this report was gathered and analyzed as a part of the Project for the Analysis of Technology Transfer (PATT).

PATT was established in November 1967 to provide a better understanding of the technology transfer process by examining non-space applications of NASA-developed technologies. To facilitate reaching this objective, PATT: (1) Operates a technology transfer data bank which documents information on the characteristics of users of NASA's Tech Brief-Technical Support Package program; (2) documents situations in which NASA-generated technologies have been applied outside the space program; (3) develops suggestions for improving the effectiveness and efficiency of NASA's technology transfer activities; and (4) maintains contact with sources of technology, with channels of technological communication, and with users of technology in order to keep up to date with developments affecting technology transfer processes.

This report summarizes progress made from April through June 1970 in achieving these goals and briefly discusses future activities. It builds on data presented in previous PATT reports as well as on results of other DRI technology transfer research.

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1 April 1970 - 30 June 1970

Contract NSR 06-004-063

-Prepared for-

National Aeronautics and Space Administration

-Prepared by-

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20 November 1970

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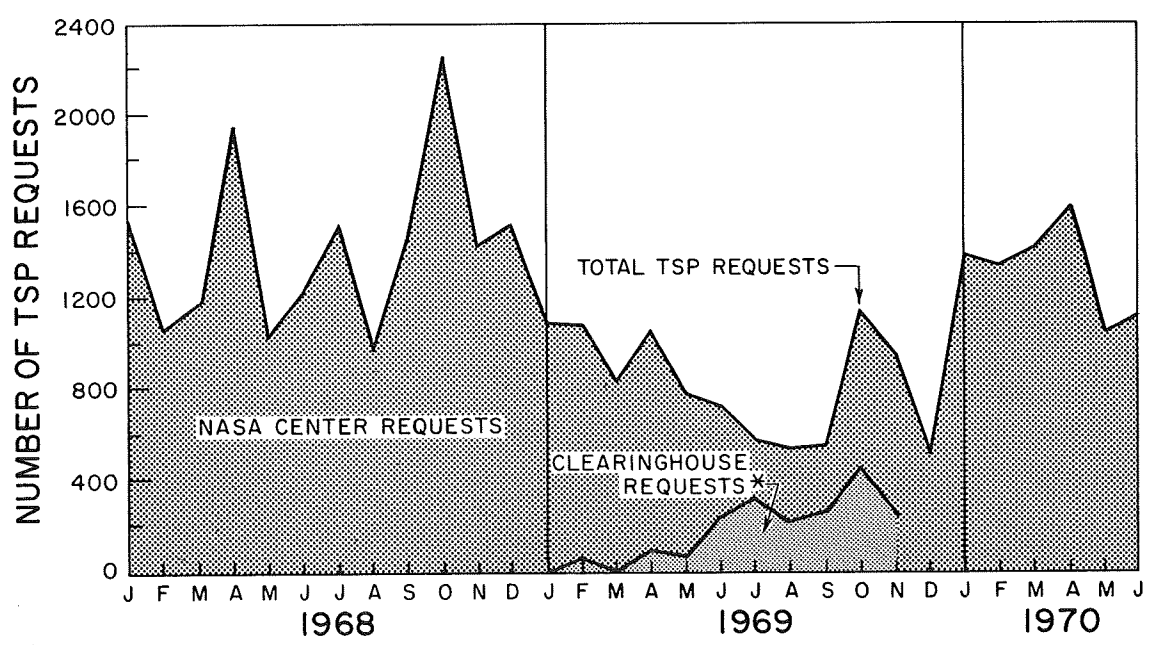
REPORT HIGHLIGHTS

- During the reporting period, PATT personnel documented 37 cases in which NASA-generated technologies have been transferred to other sectors of the U. S. economy (Section I and Appendix).
- An examination of the Tech Brief program revealed a number of ways in which the transfer effectiveness of that program might be enhanced, including (a) the regrouping of Tech Briefs as "general" or "specific"; (b) the use of a selective rather than general distribution methods; and (c) the republication of selected Tech Briefs (Section II).

SECTION I. PATT SECOND QUARTER 1970 RESEARCH ACTIVITIES

Transfer Documentation Research

PATT received 3,765 letters which had been sent to NASA by persons requesting Technical Support Packages (TSP's) during the reporting period (see Figure 1). The letters were used primarily to help identify situations in which TSP requesters were able to apply NASA-generated technologies in their research and development activities. By June 30, 1970, PATT personnel had processed 39,327 TSP request letters.



* Data on Clearinghouse requests not available after November 1969.

FIGURE 1. MONTHLY REQUESTS FOR TECHNICAL SUPPORT PACKAGES: JANUARY 1968 - JUNE 1970

The number of requests in the past 18 months for TSP's generated by different NASA field centers is shown in Table 1.

TABLE 1. REQUESTS FOR TECHNICAL SUPPORT PACKAGES, BY NASA CENTER, JULY 1969 - JUNE 1970

	1969						1970						Total
	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	
Ames Research Center	15	18	10	49	46	18	39	74	64	38	36	29	436
Electronics Research Center	24	9	16	9	5	0	0	0	0	0	0	0	63
Flight Research Center	1	0	0	1	0	0	2	2	7	1	4	0	18
Goddard Spacecraft Center	39	43	32	103	60	53	59	76	202	227	124	165	1,183
Headquarters	2	3	3	18	26	6	0	0	40	5	55	165	323
Kennedy Space Center	2	7	9	43	25	9	72	55	11	11	0	0	244
Langley Research Center	7	2	1	3	5	9	92	12	21	16	16	8	192
Lewis Research Center	68	58	102	203	94	62	129	124	225	250	93	51	1,459
Manned Spacecraft Center	80	74	76	200	70	54	124	178	218	261	254	91	1,680
Marshall Space Flight Center	279	273	238	429	240	188	459	530	513	590	382	395	4,516
NASA Pasadena Office (JPL)	44	29	30	70	65	64	67	97	48	111	61	170	856
Space Nuclear Propulsion Office	1	1	1	3	285	38	330	184	59	77	27	43	1,049
Total	562	517	518	1,131	921	501	1,373	1,332	1,408	1,587	1,052	1,117	12,019

During the first six months of 1970, TSP's originating at Marshall Space Flight Center generated approximately 36 percent of all requests; those developed at Goddard Space Flight Center, Lewis Research Center, and Manned Spacecraft Center collectively accounted for another 36 percent of the January-June 1970 TSP requests. Such variation in TSP request frequency can be accounted for partially by differences in the rate of TSP production among centers (see Figure 2), and partly by the fact that some centers produce a few Tech Briefs having very popular TSP's (see Table 2).

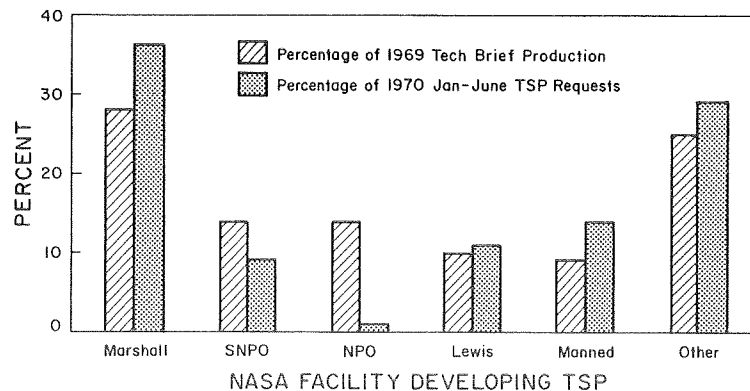


FIGURE 2. 1969 TECH BRIEF PRODUCTION AND 1970 JANUARY-JUNE TSP REQUEST FREQUENCY BY NASA FACILITY

TABLE 2. TEN TSP's MOST FREQUENTLY REQUESTED DURING
JANUARY-JUNE 1970

TSP Number	Request Frequency	Originating Center	Title
69-10705	377	SNPO	Handbook Explaining the Fundamentals of Nuclear and Atomic Physics
68-10073	305	MSFC	New Microelectronic Power Amplifier
68-10017	291	GSFC	Regulated DC-to-DC Converter Features Low Power Drain
68-10069	124	GSFC	Principles of Optical-Data Processing Techniques
67-10510	118	MSC	Probabilistic Approach to Long Range Planning of Manpower
68-10116	110	MSC	High Efficiency, High Frequency Magnetic Deflection Driver
69-10009	110	MSFC	Gun Facilities Adhesive Bonding of Studs to Surface
69-10569	101	NAPO	Automatic Frequency Control of Voltage-Controlled Oscillators
68-10235	93	LARC	Tube Swaging Device Uses Explosive Force
68-10224	81	LERC	Semiconductor AC Static Power Switch

During the reporting period, 121 telephone interviews were completed with persons who appeared to have used NASA-generated technologies. The results of 37 of those interviews are presented in the Appendix of this report. Since the inception of PATT in November 1967, 752 such interviews have been completed; approximately 25 percent of those interviews involved recontact with TSP users to determine progress in attempts to adopt technology from the space program.

Other PATT Activities

Technology Transfer Example Files. Thirteen files containing comprehensive summaries of 24 transfer cases associated with NASA-developed technologies were brought up-to-date during the April-June

period. The files are being developed primarily to provide interested groups with ready access to information on NASA-related technology transfer activities.

Conference Impact Analysis. Initial steps were taken in June to identify and describe technology transfers associated with the May 1970 "NASA Conference on Materials for Improved Fire Safety."

Technology Transfer Library and Bibliography. Holdings in the PATT library increased to approximately 1,750 titles during the reporting period. At the same time, NASA Headquarters continued its review of the revised bibliography containing 60 abstracts of key literature in the technology transfer field.

SECTION II. A GENERAL PLAN FOR STRENGTHENING THE TECH BRIEF PROGRAM

One of the major objectives of the NASA Technology Utilization Division involves "improving means for dissemination of the new technology resulting from NASA aerospace activities to scientific and engineering communities, other Government agencies and interested public and private organizations" (NASA NMI 1134.8, June 1, 1966). During the reporting period, PATT personnel completed a substantial analysis of the Tech Brief program. Part of that analysis was aimed at identifying ways in which the program could be made more effective. This section presents an operational plan for strengthening the Tech Brief-Technical Support Package (TSP) program. Preceding the plan is a summary of background material which provides a basis for the proposed changes.

The background material was generated in four different aspects of research conducted on the Project for the Analysis of Technology Transfer: (1) TSP request letters sent to NASA; (2) questionnaires returned by persons ordering TSP's; (3) interviews with certain questionnaire respondents whose answers suggested the desirability of further contact; and (4) the technology announced in Tech Briefs.

The common denominator for each of these aspects was the user's request for TSP's. The point to be emphasized is that facilitating technology transfer, in this context, reduces to a problem of inducing potential users to order TSP's. Inducement can be thought of as a marketing strategy, an operational plan.

I. BACKGROUND MATERIAL

Characteristics Based on TSP Requests and Returned Questionnaires

Non-NASA Users of Space Technology

Of all requesters of Technical Support Packages, 55 percent worked in firms employing fewer than 500 employees.

Persons in manufacturing firms accounted for 65 percent of all TSP requests. Within the manufacturing category, electrical and non-electrical machinery industries represented

nearly one-half of all TSP requests. Few TSP requests were received from the textiles and material, furniture and wood products, paper, rubber and plastics, or the food products industries.

- Engineers and managers accounted for 75 percent of all TSP requests. Scientists represented 10 percent of all requesters, and librarians 3 percent.
- Over 80 percent of TSP requesters reported earning \$12,500 or more per year.
- In terms of formal education completed, 45 percent of the requesters held bachelor's degrees, 30 percent master's degrees, and 11 percent Ph.D.'s.

The Uses Made of Space Technology

- Two-thirds of all TSP requesters reported using TSP's to keep up-to-date with developments in their technical fields.
- Only one out of eight TSP requesters reported no benefits from TSP usage. Individuals within smaller firms were twice as likely to report no benefits as those in larger firms.
- One-quarter of all TSP requesters reported using TSP's to help solve specific technical problems.

The Nature of the Technology Found Useful

- Twenty-eight percent of the documented transfers involved the development of new products or materials; 10 percent included product improvement. Twenty-one percent of the transfers represented new applications for existing products or materials; 16 percent had to do with new processes; 25 percent fell in the miscellaneous category.

- Another way of looking at the nature of the technology is to note that 75 percent of the transfers involved electrical and materials technology; by contrast, TSP's in the physical sciences category were consistently low in generating documented transfers.

User Evaluation of TSP's

- User evaluations of TSP's related to the benefits received. When no benefits resulted, evaluations tended to be low. When benefits were of an economic nature (primarily for problem solving), users gave TSP's a favorable, or above average, rating 9 times out of 10.
- There were noticeable differences in rating by technical categories. Life sciences and materials TSP's rated consistently high, while physical sciences and computer program TSP's were judged consistently low.
- Tech Briefs originating from Marshall generated over one-half of all TSP requests and rated highest in quality.

Characteristics of Transfer Case Studies

A strong association was noted between the number of TSP requests for a given Tech Brief and the number of documented transfers which that Tech Brief generated. Through 1968, 10 percent of the Tech Briefs had identifiable transfers; they accounted for approximately two-thirds of all TSP requests. Other characteristics of these Tech Briefs were identified:

- The Tech Briefs can be stratified into two main classes based on content: General (i. e., those dealing with problem classes) and Specific (i. e., those dealing with particular hardware or techniques). The proportion of General Tech Briefs has increased each year (from 3 percent in 1965 to 46 percent in 1968). General Tech Briefs provided a significantly higher proportion of the transfer examples.

- Handbooks and manuals (part of the General Tech Brief classification) represent less than 1 percent of the Tech Briefs distributed, but generated approximately 25 percent of all TSP requests and 25 percent of the transfer cases studied.
- Within the Specific content classification, Tech Briefs citing patent action or license requirements predominated (approximately 2 to 1).

Characteristics of Technologies Announced in Tech Briefs

- Certain Tech Briefs should not generate many TSP requests because constraints of various types are operative, including:
 - (1) highly specialized technology (e. g., basic research techniques);
 - (2) highly specialized user audience or environmental extremes (e. g., turbine manufacturers);
 - (3) high capital investment (e. g., purchasing costly machinery);
 - (4) cost effectiveness (or market potential) limitations on incremental technical improvements.
- The reflection of a unique technical consideration in the Tech Brief is associated with higher request frequency.
- The more mature the technology, the more likely the TSP will have a high request frequency. Conversely, Tech Briefs that report experimental or conceptual technology do not tend to generate large numbers of requests.
- Announcing the availability of TSP's in professional or trade publications appears to be associated strongly with high TSP request

frequency. Tech Briefs having secondary publication have twice the probability of high request frequency for TSP's as compared with Tech Briefs not so publicized.

- The "Selected Technical Advances" series of the Small Business Administration has exercised a strong positive influence upon TSP requests; republication of Tech Briefs in that series has correlated strongly with high request frequency.

The background information presented in this section can be unified through the following observations.

The Tech Brief program, as developed, serves its users in two major ways: problem solving and current awareness. The rapid, intact adoption of announced technologies associated with problem solving should be viewed as the exceptional rather than the usual mode of transfer. Why? Primarily because the probability is quite low that relevant technology reported in TSP's will reach a potential user at the specific time he is working on a particular problem or in the exact form required. In addition, users' strong identification of a current awareness value suggests that the major impact of the program lies in slow, incomplete adaptations. In all transfer cases technical information is adapted to specific uses; embodied forms of the technology, however, do not necessarily transfer intact.

II. GENERAL PLAN FOR MODIFICATION OF THE PROGRAM

Statement of Objectives

The NASA Tech Brief program has three principal objectives:

- (1) The most important program objective is to systematically identify, evaluate, and document certain NASA contributions to the store of knowledge.
- (2) The next most important is to provide "awareness" resources to the technical community.
- (3) The least important objective is to provide resources for rapid technical problem solving.

The point of emphasis here is that designing the system to maximize payoff for objective #3 is consistent with maximizing payoff for objectives #1 and #2. These objectives will be accomplished if the Tech Brief program is established as a basic technical resource in the industrial community.

Technology announced through the present program can usefully be divided into two classifications: general and specific. The general classification is distinguished by its relevance to broad problem areas: it usually is reported in manuals, handbooks, and compendiums. The specific classification is recognized by the singular or discrete nature of its potential application: it is often embodied in devices, techniques, and incremental improvements.

For present purposes, assume that general Tech Briefs would be distributed to higher-level managers in industrial firms as is done at the present time, while specific Tech Briefs would be sent to individuals identified through professional associations. It may be expected that company officers or department heads will route general Tech Briefs to particular people because they can recognize the relevance of general information to in-house research activities. Individual professionals operate at the level where specific technology can be rapidly adapted. The strategy suggested here would be to reach such specialists with specific technology, comprised of related Tech Briefs. By grouping Tech Briefs, both current and retrospective, a relevant information unit equivalent in impact to the general Tech Brief described above could be placed in the hands of potential adopters. The operational plan attempts to outline how this strategy might be accomplished.

The Operational Plan

The operational plan proposed is essentially a transition procedure which creates the individual mailing lists and groups specific technologies without doing violence to the present Technology Utilization Program. The approach will take certain groups of "Specific" Tech Briefs which have proven relevance and distribute such Tech Briefs through corresponding professional associations so that individuals are reached on a discipline basis. The intent over the long run is to distribute all specific technologies through proven special groupings. Each special grouping will draw on both current and past Tech Briefs. Initially only two or three special groupings should be undertaken (possibly Electrical, Metalworking, or Instrumentation). The main effort should be directed toward developing mailing lists and should be

approached through professional societies. The re-editing should be minimized so that available documentation can be utilized. The purpose in working with only a small part of the specific classification is to develop the detailed procedures for grouping and distributing Tech Briefs without disrupting the present flow. As these procedures are institutionalized, other special subject area groupings can be developed so that the Master Authority Address List distribution of "specific" Tech Briefs can be phased out entirely.

Points of Emphasis for the Present Program

Tech Briefs. The Master Authority Address List appears to have serious deficiencies. As a first step all individuals on the list should be contacted with a form letter and asked if they want to continue receiving Tech Briefs and, if so, in which of the nine technical areas. Those not responding should be dropped from the distribution list.

To further supplement the mailing list, a number of technical publications should be encouraged to present stories or announcements concerning the "new" Tech Brief program and how to participate in it. Particular emphasis should be given to trade publications serving industries that do not at the present time participate to any great extent in the program. This would include textiles and apparel, furniture and wood products, leather, rubber, plastics, and primary metals.

TSP Distribution Methods. The distribution of TSP's should continue to be handled by the NASA Centers and efforts should be made to bring requesters into even more intimate contact with the generators of new technology through Technology Utilization Officers.

To stimulate additional TSP requests, a definite program should be developed for sending Tech Briefs and TSP's to selected trade publications. This should not be handled on a mass mailing basis, but rather should be a highly selective program working with somewhere between 25 and 50 publications who have indicated some interest in reporting interesting new NASA technology. Technical editors of candidate publications should be contacted to determine their interest and to solicit suggestions on how such a program should be handled. There is an important opportunity here to help establish the special distribution system.

Republication of Tech Briefs. The available evidence suggests that if good technology is republished in some form, it will have a

continuing impact. Three specific forms of republication should be considered.

- Tech Brief "Classics." Every three months, those Tech Briefs that have generated 50 or more total requests, and where there is at least one documented transfer example, should be republished. The only suggested change in the format of the republished Tech Briefs is an indication at the top of the page that the Tech Brief is considered to be exceptional. It is also suggested that the republished Tech Brief be printed on a different colored paper. Other than these two changes, the reissued Tech Briefs would be put through exactly the same process of distribution as for a brand new Tech Brief.
- Compilations. Logical groupings of Tech Briefs and other technical materials not previously published as a Tech Brief appear to be a useful way of disseminating new technology. As indicated earlier, findings show that the more general the technology, the more likely that TSP requests will result and transfers will occur. The compilation is a way of generalizing what has previously been very specific pieces of new technology. The distribution network for compilations should be exactly the same as for Tech Briefs. In other words, the compilations themselves should be sent to everyone on the mailing list and to the technical publications. The impact of the compilations can be independently measured via the present PATT follow-up program by simply modifying the questionnaire to indicate that a TSP was ordered as a result of reading the compilation. As compilations are being prepared transfer examples should be identified for possible inclusion among the Tech Briefs and other technical materials. The inclusion of successful transfer examples probably will significantly enhance the value of the compilation by increasing its credibility. Also,

inclusion of the examples should be useful in convincing scientists and engineers that useful technology is in fact coming from the space program.

- Other Special Publications. The Small Business Administration's "Selected Technical Advances" series is an extremely important way of announcing new technology, and every effort should be made to continue to cooperate with the SBA or any other group desiring to republish NASA technology in some useful format. SBA should also be encouraged to send out Tech Brief compilations to persons on its mailing list.

APPENDIX A
Reports of Technology Transfer

REPORTS OF TECHNOLOGY TRANSFER

	Applications Actually Resulted	Applications May Result
NEW PRODUCTS	00331724--carbon dioxide gas laser 00437301--SEC television camera tube 00537424--solid lubricants utilizing porous metal composites 00537429--noncontaminating swabs 00537434--super insulation	00331840--ultrasonic method for stress analysis 00634096--RF inductor 00537426--highway grooving machine 00537433--energy absorbing device
IMPROVED PRODUCTS	00331830--portable tent for inert-gas welding 00332086--digital electronics system 00332250--silicide coatings 00433794--annealing technique for automobile components 00534057--brazing titanium to stainless steel 00634236--security system	90122290--lubricating device 00432452--tunable bandpass filters
NEW PROCESSES	00537432--energy-absorbing guardrail	None Identified
IMPROVED PROCESSES	90728234--clean room air sampler 00330342--optical alignment instruments 00330398--production tooling and processing techniques 00331846--suppression techniques 00432414--optical alignment instruments 00634164--welding of interconnect wiring 00437423--automatic checkout equipment	81119765--solid lubricants utilizing porous metal composites 00330506--contamination control
NEW APPLICATIONS	None Identified	None Identified
OTHERS	80402356--temperature measuring techniques 00231534--nondestructive testing 00331762--contamination control 00432560--safety procedures for personnel 00433904--long range manpower forecasting 00634100--contamination control 00634340--oceanographic charts	00532992--computerized material control system 00433646--long range manpower forecasting 00433802--long range manpower forecasting

Case Number: 00331724

A very small New England company used NASA technology to develop a new type of carbon dioxide gas laser. During the next twelve months, sales of this device are expected to reach \$10,000. The following year it is estimated that this amount will double or triple. The CO₂ laser was built with the basic design developed by NASA personnel. Some minor modifications have been incorporated for improved accuracy and longer life. The president of the company stated that this new product could not have been developed without the NASA technology. He estimated that at least two man-years of effort have already been saved and that further benefits from the information could be realized when other related product development efforts are performed in the future.

<u>Subject</u>	<u>Technology Source</u>
G. Finkenbeiner, Incorporated 36 Rumford Avenue Waltham, Massachusetts 617-899-3138 Contact: Gerhard Finkenbeiner President	Electronics Research Center Tech Brief 68-10564, "Repetitively Pulsed, Wave- length-Selective CO ₂ Laser"

G. Finkenbeiner, Inc., manufactures a variety of special products made of glass. Glass blowing techniques are used to produce these items and the firm is interested in improving this method of fabrication. Company President Gerhard Finkenbeiner requested the NASA information to see if this type of CO₂ laser could be successfully used for glass blowing. Tests demonstrated that it was excellent for this purpose. This is because the material absorbs the laser heat throughout its thickness instead of just at the surface.

To date, the company has fabricated approximately ten different laboratory models of this type of laser. A number of minor improvements have been made to the original NASA design, but the basic concept has not been changed. The laser is now more rigidly constructed to maintain alignment accuracy for much longer periods. Improved gas seals and thermal vacuum cleaning prior to the final gas filling gave the device an estimated life time of 7,000 hours.

Finkenbeiner estimated that five or six of the new lasers would be sold in the next twelve months. Prices vary from \$1,000 to \$3,000, depending on accessories. During the following year, he expects that sales will

Case Number: 00331724 (Cont.)

double or triple. This confidence is based on the fact that some of his customers have been wanting a device like this for some time. Anticipated customers include scientists at Purdue and Texas A & M Universities, the U. S. Geological Survey, the Tennessee Division of Eastman Kodak Company and the Missile and Space Division of LTV. Finkenbeiner also expects to develop a gas flow laser system that will have a 100 watt output as compared to 10 watts for the regular CO₂ laser. He does not know when it will be ready to sell to customers.

The availability of the NASA technology was crucial to this development effort. Finkenbeiner stated that his company could not have done it without the information that had been received. Seventy percent of the design is unchanged and because of that, he estimated that at least two man-years of effort have been saved. In the future, some additional benefits will be received, but it will be much smaller.

GFF:bh
6/5/70

Case Number: 00437301

An eastern electronics manufacturer is marketing two new television tubes, originally developed for the military and NASA and a special burn-resistant variety of the SEC tube with an annual market potential of \$5 million and \$1 million respectively (within two years). Roughly 50 percent of present sales of an estimated \$3 million of the standard model are commercial. The new tubes have applications in areas where light intensity is low, such as commercial closed circuit television, television cameras, security systems, and ground-based astronomy. The present selling price for the original SEC tube is \$2,500 and for the new burn-resistant SEC tube, \$3,500.

Subject

Westinghouse Electric Corporation
Elmira, New York
607-739-7951
Contact: Vince DeMuro
Sales Specialist for Image Tubes

During the Apollo 12 lunar mission, the SEC tube burned out when the television camera was pointed directly at the sun. To avoid future occurrences of this type of failure, Westinghouse developed a new burn-resistant SEC television camera tube. The element which produces protection against over-exposure in the new tube is a very fine copper mesh. This mesh serves as the mechanical support for the aluminum signal plate and low density potassium chloride layer, replacing the aluminum-oxide film used in the standard SEC tube. Recent tests have confirmed that the new target is orders of magnitude less susceptible to burn than the regular SEC target. In addition, the new target has completely eliminated the tendency for target substrate rupture as the result of exposure to very intense sources.

The standard SEC camera tube has a market potential of \$5 million annually within two years (as compared to \$3 million presently), and the new burn-resistant SEC camera tube is expected to sell \$1 million annually. The tubes sell for \$2,500 and \$3,500 respectively; the differential in price is attributed to the start-up costs of the new burn-resistant tube. Eventually, it is anticipated that there will be no price difference. Presently, 50 percent of the sales of both tubes are commercial, with the proportion of commercial to military sales expected

Case Number: 00437301 (Cont.)

to increase five percent per year. Because of the increased ruggedness of the new tube, the engineers at Westinghouse expect the warranty life to be longer than the 500 hours for the standard SEC tube.

Westinghouse has also developed a new Electron Bombardment Silicon (EBS) television camera tube for NASA. Since the commercial version of the EBS tubes sells for \$8,000, they are not expected to have a significant commercial market.

GP:ad
4/27/70

Case Number: 00537424

A small Ohio corporation has produced some specially lubricated components in accordance with concepts developed by NASA. To date, orders have been for small quantities of parts to be used in research programs.

<u>Subject</u>	<u>Technology Source</u>
Astro Met Associates, Incorporated 95 Barron Drive Cincinnati, Ohio 45215 513-772-1242 Contact: Robert Burns Shop Supervisor	Lewis Research Center Tech Brief: 67-10007, "Composites of Porous Metal and Solid Lubricants Increase Bearing Life"

Astro Met Associates, Inc., is a small specialized metal products company licensed to produce and sell components fabricated with this composite material. It markets under the trade name "AmCerMet." Shop Foreman Robert Burns stated that the concept was NASA's, but that the actual production processing development was performed by Astro Met. He said that while the company had received several small orders during the past year, no large amounts of money were involved. Burns could not quote sales figures, but he did indicate that one customer had placed three different orders with the firm. To his knowledge, all customers have been using the items on research projects; there have been no orders for large quantities of items. Since Astro Met is not in a position to push the product, Burns does not expect any major change in its current level of business associated with this item.

GFF:ng
5/6/70

Case Number: 00537429

A large West Coast aerospace corporation has developed a noncontaminating swab to meet the rigid standards of clean room operations where rocket engine components must be assembled in a virtually dust free and temperature controlled atmosphere. Manufacturing rights for the swabs have been licensed to a nonprofit organization which hires physically handicapped employees. Since May 1968 the organization has produced over 20,000 units and sales have totaled approximately \$3,000.

<u>Subject</u>	<u>Technology Source</u>
Build-Rehabilitation Industries 11651 Vanowen Street North Hollywood, California 91605 213-764-3700 Contact: Vincent Velez Executive Director	North American Rockwell Under contract to Marshall Space Flight Center

North American Rockwell, under contract to Marshall Space Flight Center, developed a noncontaminating swab for use in clean room operations involving dust free, temperature controlled environments. In 1968 North American's technology utilization engineers suggested the marketing possibilities to Build-Rehabilitation Industries, a nonprofit firm which employs and rehabilitates handicapped workers. North American Rockwell provided Build-Rehabilitation Industries with the technical information required to manufacture and market the swab. Since May 1968 over 20,000 units have been produced for a total sales of approximately \$3,000.

JK:ad
5/6/70

Case Number: 00537434

Using super insulation technology developed largely in connection with the space program, an Eastern sports wear manufacturer has marketed a number of products (rescue blankets, sportsman's blanket, and rescue signal), and developed a new metallized fabric that provides unique advantages for clothing, draperies, sleeping bags, tents, awnings, and bed covers. The company has sold approximately 2 million blankets since 1965 for estimated sales exceeding \$4 million. Another company, utilizing the newest material, had 1969 sales of \$3.8 million for ski parkas, jump suits, and other coats.

Subject

Norton Company
Metallized Products Division
37 East Street
Winchester, Massachusetts 01890
617-729-8300
Contact: James K. Gardner, Jr.
Division Manager

The Metallized Products Division of the Norton Company has been applying space technology to the development of a line of products which includes blankets, distress signals, clothing, sleeping bags, and draperies. The company became interested in the emissivity properties of the vacuum deposition of metals, and approached NASA for a study contract culminating in its NRC-2 crinkled aluminized .00025 inch thick mylar. This material has the highest insulating efficiency per pound of any known cryogenic insulation, and has been a staple of the Apollo Program, used for temperature control and spacecraft components, storage of cryogenic liquids, and in the suits worn by astronauts on several missions.

In 1965, Norton developed a .00050 inch aluminized polyester coated sportsman's rescue blanket intended as a disposable emergency item, and selling for \$2.00 to \$3.00 each. The following year the company came out with its "Sportsman's Space Blanket," a reusable 56X84 inch grommated sheet consisting of two .00125 inch aluminized polyester films, one colored and one clear, selling for \$7.95 each. This blanket was washable, water-proof, warmer than wool, and could be folded to

Case Number: 00537434 (Cont.)

fit a sportcoat pocket. Norton tried using the blanket material for tents, sleeping bags and garments, but because it did not breathe and was difficult to sew, it was not effective.

Further research led to metallizing directly to woven fabrics such as nylon, acetate, fiberglass, and dacron. Early in 1969 Norton and McGregor-Doniger, Inc. entered into an arrangement whereby the new fabric was used in men's wear marketed by McGregor. McGregor calls the material "Lunar V" and uses it in ski parkas, jump suits and other coats. Retail sales of the new product line in 1969 were approximately \$3.8 million.

James Gardner, general manager of Norton's Metallized Products Division, estimates that the company has sold about 2 million blankets to date. He estimates that sales will increase even more when the consumer has been educated in the concept and utility of reflective materials. He also mentioned that a small up-state New York manufacturer, Woods Bag and Canvas Company, is using these materials for lightweight sleeping bags. He also noted that Norton is currently working with drapery manufacturers to develop lightweight heat-reflective draperies.

DCC:lj
5/15/70

Case Number: 00331830

A New England company is planning to offer a NASA-developed portable tent concept as accessory equipment for a new line of special welding equipment. It is estimated that the use of this item will save the company one man-year of development effort. The tent is used to contain an atmosphere of inert-gas during certain types of welding.

<u>Subject</u>	<u>Technology Source</u>
A New England Company Contact: Vice President	Lewis Research Center Tech Brief: 65-10338, "Inert-Gas Welding and Brazing Enclosures Fabricated from Plastic Sheet"

A New England Company is currently developing a new line of DC plasma welding equipment. For certain metals like titanium, an inert atmosphere is required. Technical Support Package 65-10338, entitled "Inert-Gas Welding and Brazing Enclosure Fabricated from Plastic Sheet, " was ordered to determine whether it could be used to develop the inert atmosphere required certain welding applications. A preliminary evaluation of the NASA information has been performed and the plastic tent idea will be used. Final development of this item and the entire new line of welding equipment is being deferred until a significant improvement in the market occurs.

A company vice president estimated that the availability of this concept and engineering information regarding its use will save his company one man-year of effort. Specific changes to the tent to accommodate the particular shapes and sizes of the various welding equipment components will be required. As of this time, no estimate of the future sales volume has been developed.

GFF:ss
5/26/70

Case Number: 00332086

A large West Coast corporation has designed an improved digital electronics system by using technology developed for Marshall Space Flight Center. The information permitted the achievement of increased data rates beyond those previously attained. The engineer on the project estimated the company saved approximately 100 man-hours through its use of the information.

<u>Subject</u>	<u>Technology Source</u>
Space and Reentry Division Philco-Ford Corporation 3825 Fabian Way Palo Alto, California 94303 Contact: Larry Bellinger Senior Engineer	Marshall Space Flight Center Tech Brief: 68-10258, "Acquisition of Pseudonoise Signals by Sequential Estimation"

A high speed digital system being developed by the Space and Reentry Division of Philco-Ford Corporation required state-of-the-art data rates. Project engineer Larry Bellinger requested TSP 68-10258, "Acquisition of Pseudonoise Signals by Sequential Estimation," to determine whether it could provide the latest information in this area. Bellinger said he found the TSP to be quite useful in his design efforts. The electronics data handling concept described in the document was incorporated into hardware and improved data rates were realized. He estimated that his use of the information had saved 100 man-hours. While future benefits are likely to occur, Bellinger could not estimate their amount.

GFF:kh
4/2/70

Case Number: 00332250

A large Gulf Coast chemical company used silicide coating technology developed for the NASA Lewis Research Center. The results achieved eliminated a certain type of processing equipment failure that had been costing \$80,000 for each occurrence. The malfunctions were eliminated by significantly increasing the life of a critical component in the system.

<u>Subject</u>	<u>Technology Source</u>
A Large Gulf Coast Chemical Company	Lewis Research Center
Contact: A Corrosion and Inspection Engineer	Tech Brief: 69-10266, "Improved High-Temperature Silicide Coatings"

A new technique for producing silicide coatings has been developed by the International Harvester Company while under contract to Lewis Research Center. The process is described in TSP 69-10266, "Improved High-Temperature Silicide Coatings." A large Gulf Coast chemical company requested the TSP as part of its effort to solve a costly manufacturing problem.

During the production of ammonia, the company had experienced several nozzle failures in its processing equipment. A corrosion and inspection engineer with the firm estimated that each nozzle failure had cost his company \$80,000. The technology reported in the TSP stimulated an in-house research effort that solved the problem. Engineers developed a nozzle which would not fail during normal processing runs. Replacement of the item during regular maintenance is now often enough to completely void the problem.

GFF:ss
4/2/70

Case Number: 00433794

NASA technology has been used by a midwesterner engaged in stock car drag racing to improve some special components in his automobile. Previously, these welded aluminum parts very quickly developed tiny cracks and had to be replaced. Heat treating in accordance with procedures described in the NASA document eliminated this problem. It is estimated that use of this annealing technique saves about \$500 a year.

<u>Subject</u>	<u>Technology Source</u>
David Dewars Formerly employed by Mack Engineering Company 2626 31st Avenue South Minneapolis, Minnesota 55406 612-721-2471 Contact through: Chuck Swanson Manufacturing Engineer with Mack Engineering Company	Manned Spacecraft Center Tech Brief: 66-10458, "Heat Treatment Stabilizes Welded Aluminum Jigs and Tool Structures"

While an employee of Mack Engineering Company, David Dewars requested TSP 66-10458 that is concerned with the heat treatment of welded aluminum jigs and structures. He used the NASA technology to solve a problem with some parts on his stock car drag racer. These items were specially shaped motor mounts and an oil pan. Made of aluminum, they developed tiny cracks and required replacement quite frequently. Now, after welding, the parts are annealed in an oven for about five hours. No further cracking has been observed.

Dewars believes that the heat treatment process can be applied to other welded aluminum items in his racer where great part strength is not required. The process removes the natural brittleness of the metal at the expense of reduced strength. Dewars estimates that he saves 50 hours of labor and \$75 in material because of the availability of this NASA technology. This economic benefit will continue so long as he drag races stock cars, a hobby he intends to pursue for sometime.

GFF:ss
 5/28/70

Case Number: 00534057

A product improvement, made possible by using a NASA-developed alloy, enabled a Midwest manufacturer to produce higher quality aircraft components for substantially less money. Prior to his use of the new alloy, the manufacturer applied stainless steel to a proprietary component. The new alloy permitted him to braze titanium to stainless steel, producing a higher quality and less costly product.

<u>Subject</u>	<u>Technology Source</u>
A Midwest Manufacturer Contact: A metallurgical engineer	Manned Spacecraft Center Tech Brief: 65-10060, "New Alloy Brazes Titanium to Stainless Steel"

Engineers at a Midwest manufacturing company had considered using titanium on a proprietary component manufactured for one of the company's systems used on aircraft. In the initial design phase, however, it was determined that the temperature and performance characteristics required of the system would not permit the brazing of titanium to stainless steel since a satisfactory brazing technique or brazing alloy was not available.

Although a number of systems had been manufactured using stainless steel in lieu of titanium, a company spokesman said that revised specifications received from a major customer demanded that titanium be used in future systems. To overcome this problem, company engineers referred to several sources and through a trade publication became aware of a brazing alloy developed by North American Aviation under contract for the Manned Spacecraft Center. After reviewing and testing the alloy, it was determined that titanium could be successfully brazed to stainless steel in the system; this would not only enable the company to meet their revised requirements but would also reduce manufacturing costs.

The company spokesman stated that the technology received from NASA was quite important in making the product improvement change. Although he felt that other methods could have been used to solve the problem, it was not necessary to consider them since the NASA method proved to be very satisfactory. The spokesman estimated that the company spent \$12,000 to \$13,000 in reviewing and implementing the NASA technology

Case Number: 00534057 (Cont.)

which he said is offset by the expected savings in manufacturing costs. It was estimated that the product improvement change will cut the system cost by five percent and the cost of manufacturing the component by as much as 50 percent which he estimated was a savings of over \$10,000 per year for at least 2 to 3 years. He remarked, however, "the important thing is that the technology enabled us to meet the customer's demands."

RLB:sjs
6/25/70

Case Number: 00634236

A small Eastern electronics manufacturer has incorporated NASA technology into the design of an improved security system that has now been bid on several jobs. The firm expects that the majority of the proposals will be successful. A company official indicated that the new system could result in 15 to 20 percent more jobs of this type in the future.

<u>Subject</u>	<u>Technology Source</u>
A Small Eastern Electronics Manufacturer Contact: Vice President	Goddard Space Flight Center Tech Brief: 67-10656, "Low Cost SCR Lamp Driver Indicates Contents of Digital Computer Register"

A small Eastern electronics manufacturer produces custom security systems for various commercial and industrial uses. The company is a regular subscriber to the NASA Tech Brief program. The firm's vice president ordered TSP 67-10656 because he thought he had an application for the type of circuitry it describes. A simplified version of the NASA concept was included in about a dozen new systems. The vice president said that the information received was quite important to the new system. He expects that the majority of the bids now out will be successful. Sales of this type of security system are expected to increase by about 20 percent. He said that his firm needed a unique item that was low in cost and reliable to win more contracts for this type of hardware. The NASA technology provided this information to gain a competitive advantage for this company.

GFF:sjs

6/25/70

Case Number: 00537432

Engineers in a large Southwestern research organization, concerned about reducing the serious death toll in highway bridge railing crashes, have succeeded in converting NASA-developed energy-absorbing technology into a new kind of bridge railing. The key idea of the new railing system is that the tremendous energy of such an impact, instead of being absorbed entirely by the vehicle, would in part be spent harmlessly in producing a shower of aluminum fragments from tubing built into the railing for that purpose. Governmental and private professional groups are planning to introduce some form of the improved bridge guardrails on an experimental basis in certain sections of the country.

<u>Subject</u>	<u>Technology Source</u>
Southwest Research Institute (SwRI) 8500 Culebra Road San Antonio, Texas 78228 512-684-2000, Ext. 383 Contact: William E. Woolam Senior Research Engineer	Langley Research Center Tech Brief: 63-10304, "Breakup of Metal Tube Makes One-Time Shock Absorber, Bars Rebound"

Highway fatality statistics indicate that in recent years roughly one-third of the fatal vehicle accidents have involved fixed objects along high-speed highways, and that 22 percent of those accidents involved bridge barriers. A serious problem associated with such bridge accidents is the snagging of vehicle wheels on guardrail posts, making what might have been a glancing encounter a violent crash. As part of an attempt to solve this problem, the Federal Bureau of Public Roads contracted with the Southwest Research Institute (SwRI) to develop more satisfactory bridge guardrails.

William E. Woolam, SwRI engineer who managed the project, recently said he found the basic idea for solving the problem in NASA publications describing energy-absorbing fragmenting tube technology. The technology Woolam adopted was conceived by NASA engineers at Langley Research Center who were seeking a lightweight energy absorber to protect manned spacecraft during a hard landing.

The key idea of the new railing system is that the tremendous energy of bridge impacts, instead of being absorbed entirely by the vehicle, would in part be spent harmlessly in producing a shower of aluminum fragments

Case Number: 00537432 (Cont.)

from tubing built into the railing for that purpose. According to Woolam, tube fragmentation absorbs enough of the energy of such impacts to reduce collision forces to tolerable levels for vehicle occupants protected by both seat and shoulder belts.

Woolam identified two major problems facing widespread adoption of the new bridge railing concept: manufacturing costs per unit are higher than standard guardrail production costs; in addition, the new railing requires that bridges be constructed on a four-foot wider bridge bed than standard guardrails require. He predicted, however, that both problems would be solved through future research. In the meantime, he said plans are being developed by a number of public and private groups to experiment with different versions of the new guardrail in certain parts of the country.

JEF:kcr
5/15/70

Case Number: 90728234

A small New England manufacturer of engineering instruments has reduced operating costs by \$3,000 per year by using a clean room air sampler device developed for Marshall Space Flight Center. Although the use of the device has not eliminated the problem of airborne particles in the firm's clean room, it has provided the company with the ability to control and identify contaminants without the expense of constructing another clean room.

<u>Subject</u>	<u>Technology Source</u>
Berger Instruments 37 Williams Street Boston, Massachusetts 02119 617-442-5100 Contact: David V. St. John Design Engineer	Marshall Space Flight Center Tech Brief: 67-10076, "Clean room Air Sampler Counts, Categorizes, and Records Particle Data"

Berger Instruments is a small company that manufactures engineering instruments primarily for surveying. Design engineer David V. St. John could not elaborate on one of its processes because of the proprietary nature, but indicated the company had been faced with problems caused by airborne particle contamination in its clean room. To overcome the problem and alleviate the need for constructing a new clean room, company engineers were able to incorporate a clean room air sampler as suggested in a NASA Technical Support Package.

The air sampler helps the company monitor airborne particles in the clean room and to identify and sample the particles, which has resulted in better over-all process control. Although the technology has not eliminated the fact that airborne particles are still present in the clean room, it has provided the company with acceptable controls without the necessity of constructing a more sophisticated clean room. As a result of the company's ability to monitor the clean room atmosphere, St. John said that product reliability has increased and product yield has increased an estimated 40 percent. In addition, the company has been able to reduce the number of steps required in its manufacturing process which has reduced manufacturing costs by an estimated \$3,000 to \$6,000 per year.

Case Number: 90728234 (Cont.)

St. John remarked that the Technical Support Package received from NASA was "excellent." In addition to providing a solution to the company's problem, he said the NASA technology also helped them to determine necessary clean room requirements.

RLB:ad
4/1/70

Case Number: 00330342

A small Minnesota manufacturing company has used a NASA manual describing the alignment of optical instruments to improve the accuracy of special precision metal parts it produces. The document provided the information necessary to properly operate the equipment so as to produce photo etched parts with variations of less than 10 millionth's of an inch. Personnel routinely perform the required alignment techniques. A company official could not estimate the value of the technology, but he indicated the accuracies obtained could not have been realized without the NASA information.

<u>Subject</u>	<u>Technology Source</u>
Hutchinson Industrial Corporation 40 West Highland Park Hutchinson, Minnesota 55350 612-896-1515 Contact: Jeffrey Green Vice President	Marshall Space Flight Center Tech Brief: 68-10574, "Training Manual on Optical Alignment Instruments"

Hutchinson Industrial Corporation manufactures special metal parts using a photo etching process. Vice President Jeffrey Green ordered TSP 68-10574, entitled "Training Manual on Optical Alignment Instruments," because it appeared related to problems encountered during the production of special parts with very strict tolerances. Personnel had not been able to align existing company equipment to properly control the manufacturing process. After learning the techniques described in the NASA manual, the operation of the instruments improved so that satisfactory parts could be made. The alignment effort is not automated and only an occasional reference is made to the document. The instruments are used to make measurements of millionths of an inch and to adjust plotting (manufacturing) tooling to those tolerances. Most of those parts are used in computers.

Unfortunately, Green could make no estimate of the economic benefit received from the technology. He stated that the various instruments and tools could not have been aligned that well without the NASA manual. Green further mentioned that the company was now very happy with the parts. Previously, this had not been the case.

GFF:sjs
5/22/70

Case Number: 00330398

A small California manufacturing company has used NASA technology regarding thermal properties of materials to improve production tooling and processing techniques. Brazing fixtures accurate to 1/10,000th's of an inch were developed with the information contained in the document. A company official estimated his firm has saved at least 25 man-hours by using the NASA document and will probably save 100 hours per year in the future.

<u>Subject</u>	<u>Technology Source</u>
Pyromet Industries A Subsidiary of Ontario Corporation 595 Industrial Road San Carlos, California 94070 415-591-7161 Contact: Tsutomer Hikido Laboratory Director	Marshall Space Flight Center Tech Brief: 69-10055, "Thermal Expansion Prop- erties of Aerospace Materials"

Pyromet Industries manufactures special metal parts and also performs custom brazing and heat treatment services. Its research lab provides fixture design and production process information to support this operation. Laboratory director Tsutomer Hikido requested TSP 69-10055, entitled "Thermal Expansion Properties of Aerospace Materials," to assist in this manufacturing support effort. He found the document to be quite useful in improving the design of production fixtures. These are now fabricated and used to maintain tolerances of 1/10,000th's of an inch during brazing operations. The materials technology has also been applied to the actual steps during the manufacturing processes and some changes were made to improve overall product quality. These included such things as machining sequence, depth of cuts, etc. This information will continue to be useful because Pyromet's business is involved with custom work that periodically keeps changing. Hikido was at first reluctant to estimate the actual economic benefits. After discussing the matter at some length, he conservatively estimated that the NASA technology had already saved at least 25 hours. In the future, a reduction of 100 hours a year in manufacturing support will probably be realized. These numbers would have been larger if more use of aerospace type materials was required in Pyromet's operations.

GFF:ss
5/22/70



Case Number: 00331846

NASA technology on suppression techniques enabled technicians in a New England machine tool company to solve certain technical problems and to incorporate a product reliability improvement change. Attempts had been made by company technicians to overcome problems in control circuitry for machine tools by applying various suppression techniques. However, those attempts were not successful until the values being used were recalculated by the technicians in accordance with the information received from NASA. A company spokesman said that through trial and error the problem could have been solved, but with the available NASA technology the problem solving process was speeded up considerably and more accurate results were obtained.

<u>Subject</u>	<u>Technology Source</u>
Torin Corporation Machine Division Kennedy Drive Torrington, Connecticut 06790 203-482-4422 Contact: Charles Collins Electrical technician	Marshall Space Flight Center Tech Brief: 66-10449, "Basic Suppression Tech- niques are Evaluated"

At the Machine Division of the Torin Corporation, trouble with electrical devices was experienced in building control circuitry for machine tools. In attempting to overcome that difficulty, electrical technician Charles Collins said various suppression techniques were tried, but the values used were not adequate. However, after receiving NASA-generated technology on suppression techniques, it was possible to more accurately calculate the values and to incorporate changes which improved the reliability of the control circuitry.

Collins said it took awhile to understand the information received from NASA, but once they learned how to interpret the data it proved to be quite important in solving the problem. Through trial and error, Collins said they could have eventually solved the problem. However, this was not necessary since the NASA information provided the required solution. By allowing them to solve the problem more quickly and more accurately, Collins said definite savings in time and man-hours occurred, but he could not estimate the amount of savings.

RLB:kh
4/2/70

Case Number: 00432414

The product development group of a large Eastern corporation has used NASA technology to improve its operation of precision optical alignment equipment. A NASA training manual on this subject was used to describe techniques necessary to properly perform optical alignment of critical reference surfaces for a company product development effort. A company engineer stated that the document was very effective for this purpose.

<u>Subject</u>	<u>Technology Source</u>
Kodak Apparatus Division Eastman Kodak Company 901 Elmgrove Road Rochester, New York 14650 Contact: Walter W. Jacobe Development Engineer	Marshall Space Flight Center Tech Brief: 68-10574, "Training Manual on Optical Alignment Instruments"

The Kodak Apparatus Division is responsible for the development of some of the new products for the parent company. Development engineer Walter Jacobe ordered TSP 68-10574, entitled "Training Manual on Optical Alignment Instruments," to see if it could assist laboratory personnel in learning the proper operation of auto-collimators. He stated that the NASA document was a good source of information regarding techniques that can be used to obtain very accurate results with these instruments. Personnel were trained with this information; they subsequently performed optical alignment of critical surfaces relative to a laboratory reference point as part of a development project for a new company product.

GFF:sjs
6/1/70

Case Number: 00634164

A large national manufacturer has used NASA technology to improve the welding of interconnect wires in a new electronics device. A company quality engineer stated that the NASA document was used as a guide in performing the operations; he indicated the information also provided a basis for analyzing the results achieved. Development effort on the new equipment is expected to continue for some time.

<u>Subject</u>	<u>Technology Source</u>
International Business Machine Corporation Systems Manufacturing Division P.O. Box 950 Poughkeepsie, New York 12602 914-463-3914 Contact: Somnath Bhattacharya Quality Engineer	Marshall Space Flight Center Tech Brief: 68-10310, "Standards for Compatibility of Printed Circuit and Component Lead Materials"

The Systems Manufacturing Division of IBM is currently developing a new electronics system. Included in it is a small device that contains a significant amount of interconnect wiring. Quality engineer Somnath Bhattacharya ordered TSP 68-10310, entitled "Standards for Compatibility of Printed Circuit and Component Lead Materials," to see if this NASA document could be of assistance in this development effort.

Bhattacharya reported that information in the document had been used to help resolve problems with respect to welding of the interconnect wiring. Personnel studied it and followed the guidelines in it during fabrication of models of the device. Inspection personnel examined the welds and an analysis was made using information in the document. Bhattacharya said that the NASA technology had been helpful and that he would continue to use it during the continuing development effort. He felt that a more accurate estimate of the benefits received from it could be made in about six months. No information is currently available on when the system will be marketed or what its sales volume would be. Bhattacharya learned of the availability of the TSP through a professional journal.

GFF:sjs
6/26/70

Case Number: 00437423

A large automobile manufacturer has incorporated technology it developed for NASA into the design of new automatic checkout equipment for final inspection of assembled wheel brake cylinders. The inspections involve normal operation of the equipment with an immediate indication of acceptance or rejection. Special procedures are required to remove any item that fails the test. A project engineer stated that the technology has probably saved about \$5,000 in an inspection program originally expected to cost the firm \$60,000. This new system's capability for more accurate measurements also has improved the quality level of completed assemblies. Minor defects, previously not identified, are now detected routinely.

Subject

Chrysler Corporation
Space Operations Division
Huntsville, Alabama 35812
Contact: Dave Fox
Project Engineer

Chrysler Corporation's Space Operations Division in Huntsville, Alabama developed an electronic checkout system for the Saturn 1B vehicle. Utilizing similar rapid presentation techniques along with conventional equipment, this group developed a system to test wheel brake cylinders for automobiles. It was installed in Chrysler's Toledo (Ohio) Machining plant and has been in operation for over one year. Each of the four stations in the system can inspect five units a minute. Each item is given an operational check by moving the cylinder while holding the piston. If the pressure within the part drops more than 5/100ths of a pound psi., it is rejected. Different indicator lights are used to show acceptance, small leaks and major leaks. Units that have been rejected are held by the positioning clamps until the instrument has been reset. Only then can it be removed. All units that leak enough to be detected are not accepted for use without rework and subsequent retest. The pressure drop sensing capability of the new system is an order of magnitude more accurate than the previous one. This has resulted in an improved level of quality of this component since many more minor defects can be detected.

Project engineer Dave Fox said that about 20 percent of the system resulted from the previous NASA program efforts. He further estimated

Case Number: 00437423 (Cont.)

a savings of approximately \$5,000 on the \$60,000 program. A second system has been proposed and it will probably be built and installed in the Toledo plant within the next year. There is future potential for this type of equipment in the automotive and other related manufacturing industries, wherever automatic inspection and/or testing of a large quantity of parts is required. The major problem is the high cost of the sophisticated equipment (\$15,000 a unit for a simple device) needed to perform these tasks. In each such system, the NASA technology will be used. Some of them may employ computers, which would mean an even greater use of NASA information.

GFF:ss
4/21/70

Case Number: 80402356
 (Supersedes Telephone Follow-up of 5/24/68)

A pyrometer handbook prepared by NASA personnel has been used by a Midwestern research group to establish temperature measuring techniques necessary to conduct laboratory studies on silicon slices. Final selection of the proper pyrometer and subsequent operation of the device were made with the assistance of the NASA information. A project physicist indicated that the handbook is now used routinely by the research personnel in his group.

<u>Subject</u>	<u>Technology Source</u>
Conductron - Missouri (Division of Conductron Corporation) Box 426 2600 North Third Street St. Charles, Missouri 63301 314-723-1515 Contact: Ronald Knowland Physicist	Lewis Research Center Tech Brief: 66-10520, "Pyrometry Handbook Describes Practical Aspects of Surface Temperature Measurements of Opaque Materials"

The Silicon Integrated Circuits Group of Conductron - Missouri has been using a particular pyrometer in its research on silicon slices for approximately two years. Instrument selection was made with the help of the information contained in a NASA handbook describing practical aspects of surface temperature measurements of opaque materials. That document also has been used by group personnel operating the pyrometer. Physicist Ronald Knowland said company personnel "now use the pyrometer like a screwdriver." Since Knowland was not with the company earlier, he could give no estimate of the economic benefit received from this technology.

The research project is concerned with growing a 1/2 mil thick layer of silicon on a silicon wafer. It is performed in a silicon epilaxil reactor at a temperature of about 1,225°F. The pyrometer is used to monitor the temperature of silicon slices during the processing operation. This is an in-house development and future production plans are indefinite at this time.

GFF:sjs
 5/6/70

Case Number: 00231534

A large Eastern electrical manufacturing company has used a training manual prepared for NASA's Marshall Space Flight Center to plan an in-house training program for quality control inspectors. To date, 21 engineers have completed the course. The process control engineer who developed the training program estimated his use of the NASA document saved him approximately 25 hours in preparation time.

<u>Subject</u>	<u>Technology Source</u>
Large Generator and Motor Department General Electric Company Schenectady, New York 12305 Contact: E. P. Caisse Process Control Engineer	Marshall Space Flight Center Tech Brief: 68-10391, "Training Manuals for Non- destructive Testing"

The Large Generator and Motor Department of General Electric Company is manufacturing all types of power generation equipment. Process control engineer E. P. Caisse was preparing a training program for quality control inspectors regarding nondestructive testing techniques. He ordered TSP 68-10391, "Training Manuals for Nondestructive Testing," to assist with this effort. This NASA document was prepared for Marshall Space Flight Center by the Convair Division of General Dynamics.

Caisse stated that the NASA information was very helpful during the preparation of the course. Over 50 percent of the training program that was developed came from the document. He estimated that a savings of 25 man-hours had been achieved by using the NASA technology. This course has been presented to 21 students and was well received. Future savings may be realized, but Caisse could not estimate the amount.

GFF:ss
4/6/70

Case Number: 00331762

The U. S. Department of Agriculture has used NASA contamination control technology to set up and operate clean room research facilities in Louisiana. The facilities are used in a program designed to develop edible cottonseed products. A project research chemist said that the NASA handbook was very important in planning and operating the clean rooms.

<u>Subject</u>	<u>Technology Source</u>
Southern Utilization Research and Development Division U. S. Department of Agriculture 1100 Robert E. Lee Boulevard New Orleans, Louisiana 70119 Contact: Dr. H. H. Mottern Research Chemist	Marshall Space Flight Center Tech Brief: 68-10392, "Contamination Control Handbook"

The Southern Utilization Research and Development Division of the U. S. Department of Agriculture is currently conducting an investigation into possible edible cottonseed products. For this effort, it was necessary to establish several clean rooms similar to those commonly used in the aerospace industry. TSP 68-10392, "Contamination Control Handbook" was requested to assist in the final design, maintenance and operation of these facilities. The Sandia Corporation prepared this NASA document for the Marshall Space Flight Center.

Research chemist Dr. H. H. Mottern stated that he had found the handbook to be an excellent source of information regarding clean rooms. The guidelines in it have been followed in the preparation of these special facilities. Four different rooms were set up, each isolated from the others. Dr. Mottern said that the sections in the handbook on microbiological contamination and personnel were particularly helpful, the latter for training and setting up standard operating procedures. Maintenance of the clean rooms was also performed in accordance with information contained in the document. Because of the research nature of the effort, Dr. Mottern could not estimate the value of the benefits that had been received from this technology. He did feel that the NASA information was very valuable to the program and that certainly time and effort had been saved.

Case Number: 00331762 (Cont.)

The primary goals of the research effort are to develop a more profitable use for the seeds after they have been used in the production of cotton oil, and to produce an additional source of protein food for humans. Now, the used seeds can only be fed to animals. It appears that a low cost, high protein flour can be produced; also a high protein concentrate and protein isolates are feasible products for human use. These latter items require a large quantity of bacteria free, clean air during production. This has been achieved with the application of the technology provided by NASA. Dr. Mottern did state that quite a bit of their clean room operations did not require the complete controls described in the handbook. In those cases, a reduced level of application has been used. Particular care is taken, however, to insure that all inedible portions of the seeds are kept separated from the edible parts. Positive air pressure is also maintained in the clean rooms to keep outside contaminants from getting in. This research effort is expected to continue for quite some time and the benefits of the NASA technology should continue to be realized throughout the program.

GFF:ss
4/7/70

Case Number: 00432560

A small New York manufacturing company has used NASA developed technology regarding health hazard information to verify that current safety procedures are adequate to protect the health of employees. The company's president could not estimate the magnitude of any cost savings as a result of having the NASA document, but he did indicate that the information was very valuable to his firm.

<u>Subject</u>	<u>Technology Source</u>
Wright Industries 412 55th Street Brooklyn, New York Contact: Dr. Harold G. Wenig President	Lewis Research Center Tech Brief: 69-10268, "Health Hazards of Ultrafine Metal & Metal Oxide Powders"

Wright Industries is a small company engaged in manufacturing a number of different magnetic materials. Company President Dr. Harold Wenig ordered TSP 69-10268, "Health Hazards of Ultrafine Metal and Metal Oxide Powders" to learn of the latest technology regarding this subject. He stated that the information in the TSP was very helpful, because it confirmed that the safety procedures practiced by his company employees during manufacturing operations are adequate to protect their health.

GFF:kh
4/15/70

Case Number: 00433904

A Midwest manufacturing company has used NASA-developed technology in the preparation of new planning techniques for long range manpower forecasting. The firm's director of planning estimated that the company will save 5,000 man-hours per year with this system. The NASA technology used for developing the planning techniques was prepared for the Manned Spacecraft Center by Texas A & M University.

<u>Subject</u>	<u>Technology Source</u>
Wolverine Tube Division Calumet & Hecla Corporation 17200 Southfield Road Allen Park, Michigan 48101 Contact: J. H. Kinnally Director of Planning	Manned Spacecraft Center Tech Brief: 67-10510, "Probabilistic Approach to Long Range Planning of Manpower"

The Wolverine Tube Division of the Calumet & Hecla Corporation manufactures small tubing used in air conditioners and other heat exchanger equipment. The company is currently developing new planning techniques to assist with the management of the firm. Planning director J. H. Kinnally requested TSP 67-10510, "Probabilistic Approach to Long Range Planning of Manpower," to help with the effort. This document was prepared by Texas A & M University for the Manned Spacecraft Center.

Kinnally and his planning committee used the information to stimulate research activity that led to a defined approach for both short and long range manpower forecasting. He stated that the TSP contained good conceptual information that was modified to fit the type of system needed for his company. Manpower planning for the Wolverine Tube Division is now accomplished using the new technique.

Kinnally estimated that a labor savings of 5,000 hours per year could be attributed to the forecasting assistance gained from the NASA technology. Since use of the new planning techniques is made on a regular basis, future savings are expected to continue at approximately the same rate.

GFF:kh
 4/14/70

Case Number: 00634100

A Pennsylvania division of an Eastern electronics corporation has used NASA contamination control technology to make improvements in its production of special negatives required for manufacturing micro-miniature computer components. The information was used to set up special facilities to furnish purer processing water as well as to provide additional training opportunities for clean room personnel. Production quantity and quality both were increased as a result of the changes. Since other modifications were made to the process at the same time, no accurate figures for this improvement are available. However, a company official estimated that the increase resulting from use of the NASA technology was on the order of 20 percent.

<u>Subject</u>	<u>Technology Source</u>
Photics Research Corporation A Division of Viatron Corporation Industrial Center Montgomeryville, Pennsylvania 18936 215-368-0330 Contact: William Kiermaier Research Associate (No longer at Photics Research) Mr. Landis Vice President, Quality Control	Marshall Space Flight Center Tech Brief: 68-10392, "Contamination Control Handbook"

The Photics Research Corporation produces a variety of photomask negatives for its parent company, Viatron Corporation. They are used to manufacture silicon wafers containing a large number of integrated circuits for a low cost computer. During preparation of the negatives, their images are reduced in size many times. Because of this, contamination during processing is a major problem. Research associate William Kiermaier ordered TSP 68-10392, entitled "Contamination Control Handbook," to assist him in his effort to improve production of these negatives.

Kiermaier reported that the NASA document was quite helpful to him. He used information in the handbook to set up a reverse osmosis, deionized water facility. This equipment provided cleaner water for the entire production process. Kiermaier also used the handbook to give personnel additional training about proper clean room procedures. Because a large number of processing modifications were made at the

Case Number: 00634100 (Cont.)

same time, the benefits in improved production as a result of the NASA information can only be estimated. Kiermaier felt that it amounted to about 20 percent. His supervisor, Mr. Landis, vice president - Quality Control, verified that this number was reasonable. Kiermaier learned about the availability of the "Contamination Control Handbook" from a person outside of his organization.

GFF:bh
6/25/70

Case Number: 00634340

A New England university has used NASA information concerning future oceanographic research areas in a new course entitled "Introduction to Ocean Technology." The NASA material assists students by giving them a good overall view of oceanography and by indicating specific aerospace capabilities which may assist in future oceanographic programs.

<u>Subject</u>	<u>Technology Source</u>
University of New Hampshire Durham, New Hampshire 03824 603-862-1356 Contact: F. A. Blanchard Professor of Electrical Engineering	Marshall Space Flight Center Tech Brief: 68-10397, "Charts Designate Probable Future Oceanographic Research Fields"

The University of New Hampshire's Engineering School offered a seminar type course on ocean technology during the 1970 spring term. Professor F. A. Blanchard ordered TSP 68-10397, entitled "Charts Designate Probable Future Oceanographic Research Fields," to assist in the preparation of the course syllabus.

Blanchard reported that the charts were quite useful for describing aerospace capabilities for oceanographic research. The students were able to get a good understanding of the total technological field and select areas of interest for further research. He indicated that the charts contained much valuable information on this subject; however, the reproduction was poor, leading to some difficulty in reading the charts. Blanchard said that the NASA information was helpful to the University, but he could not estimate the value of this benefit. He learned of the TSP from a trade publication.

GFF:sjs
6/26/70

Case Number: 00331840

NASA-generated technology on an ultrasonic method for stress analysis that allows for more thorough analysis of complex geometric structures may be used as the basic technology in a new product to be developed by a New England electronics manufacturer. After reviewing the NASA technology, company management expressed confidence that nondestructive testing equipment for measuring stresses can be developed not only for stress analysis of aluminum alloys, but also for ferrous alloys. At the present time the manufacturer is discussing the possibilities of obtaining patent protection before proceeding with further research and development activities.

<u>Subject</u>	<u>Technology Source</u>
New England Electronics Manufacturing Company Contact: Manager, Research	Marshall Space Flight Center Tech Brief: 67-10428, "Ultrasonics Used to Measure Residual Stress"

Principles used in an ultrasonic method for stress analysis developed under contract for NASA has stimulated interest at a New England electronics manufacturing company. Research engineers at the company had been working with a concept for measuring stresses nondestructively when they learned of the available NASA-generated technology. After visiting the Marshall Space Flight Center and reviewing their equipment, the company feels that the principles used in the NASA Technical Support Package can be applied to a new product for measuring stresses in ferrous alloys as well as aluminum alloys.

A company spokesman said that the current NASA technology works well with aluminum alloys. However, it is felt that to have the necessary market potential the test equipment must also be capable of measuring stresses in ferrous alloys which is possible if critical control of the time elements can be maintained. According to the company spokesman, nanoseconds are critical on ferrous metals. In order to increase the market appeal and flexibility of the equipment, the company plans to design the equipment so that it is considerably more compact than the present NASA design.

The company is currently negotiating a licensing agreement with the various innovators which they expect to complete in three months. They

Case Number: 00331840 (Cont.)

will then complete prototype development (breadboarding) to prove the ferrous alloy measuring capability. The availability of the NASA technology has been crucial to them in developing this product and the spokesman said they have been particularly happy about the help and cooperation they have received from the Marshall Space Flight Center. Although the spokesman could not estimate the savings contributed to date as a result of the available NASA technology, he said the overall savings will be significant assuming they can negotiate satisfactory licensing agreements.

RLB:kh
4/10/70

Case Number: 00634096

A small New Jersey manufacturing company is searching for a new product to supplement its current line. One item under serious consideration is an improved RF inductor invented by NASA personnel at the Jet Propulsion Laboratory. The vice president of the company said that the availability of such information was very important to his firm.

<u>Subject</u>	<u>Technology Source</u>
A New Jersey Company Contact: Vice President	Jet Propulsion Laboratory Tech Brief: 67-10106, "RF Inductor has High Q, is Stable at Higher Temperatures"

A small New Jersey printing plate manufacturer is seeking a new group of products to supplement current company business. The firm's vice president stated that increasing competition from other types of copying equipment like Xerox, etc., was forcing this move. He ordered TSP 67-10106, entitled "RF Inductor has High Q, is Stable at Higher Temperature," to see if it could be considered as a possible future product.

The vice president said that the inductor described in the NASA document is currently one of several possibilities being considered. He feels that the availability of new technology is very helpful to his searching effort. He was very interested to learn about the new cumulative index of NASA Tech Briefs. He indicated that he would order it to use in looking for further new items. The inductor information availability was learned through his contacts with the Small Business Administration. The vice president indicated that a decision on which product to develop would probably not be made for several months. The item selected must be generally within the capability of the firm's current equipment and personnel. At this time he could not estimate the magnitude of economic benefits associated with this transfer of technology.

GFF:sjs
6/26/70

Case Number: 00537426

The Construction Products Division of a Midwestern company has manufactured three prototypes of a machine for grooving highways and airport runways. The company is getting into production for 12 additional machines to be completed by the end of the year. Although no price has been set, it is estimated that the machines will cost approximately \$18,000 each to produce. This machine is an outgrowth of research conducted by the Langley Research Center on the effect of grooving on roads and airport runways.

Subject

Construction Products Division
Norton Company
P.O. Box 9604
Kansas City, Missouri 64134
816-761-9500
Contact: Mr. Perkins

Experiments of putting grooved surfaces on airport runways were started in England in 1961. In the United States, much experimentation has been carried on by the Langley Research Center. The grooved surface drains water and oil off the pavement and thus prevents trucks, cars or airplanes from spinning out of control in skids.

Designing a machine for grooving road and runway surfaces accurately and economically proved quite difficult for the Norton Company. A major problem was to develop a mechanism to cut the grooves to uniform depth in spite of variations in the road's surface. The first experimental machines tended to skip over and cut too shallow grooves on indented surfaces which actually presented the most skid perils.

DCC:ad
5/12/70

Case Number: 00537433

A Rocky Mountain area research organization is utilizing NASA technology in the development of an energy absorbing device to be incorporated into the support wheel structure of transport trailers. Now in the final stages of prototype development, current plans are to install it on 50,000 trailers a year. The device deforms under excessive loading, thereby protecting the trailer structure. A new company may be formed to produce this item.

<u>Subject</u>	<u>Technology Source</u>
Denver Research Institute University of Denver Denver, Colorado 80210 303-753-2719 Contact: Richard J. Fay Research Engineer	Langley Research Center Tech Brief: 63-10304, "Break-up of Metal Tube Makes One-Time Shock Absorber, Bars Rebound"

The Denver Research Institute (DRI) is currently developing a one-time shock absorbing device for use on transport trailers. Design of the item is based on the concepts contained in a TSP. DRI research engineer Richard J. Fay said that the NASA concept has been successfully adapted to a quite useable device for this application. He further indicated that the Fruehauf Trailer Corporation is very interested in this item.

The device consists of a tube and mandrel that are held together by welds that are strong enough to withstand all normal loads. When an excessive load is applied, the welds are broken and the tube is driven into the mandrel. Its shape causes the tube walls to fracture and deform, thereby absorbing the extra energy. The deformation ruins the device, but protects the trailer structure. In this application, each leg of the trailer support structure would have a device incorporated into it. If the rig drops because the support structure is not adequately lowered, the trailer is not damaged. Fruehauf estimates that it can use 50,000 pairs of these energy absorbing cushions each year. While most will be used by Fruehauf, some are to be sold to other manufacturers.

The economic aspects of this case are not yet clearly defined. The engineers on this project are considering the formation of a small company to produce the item. Sales are conservatively estimated at \$500,000 per year. Fruehauf has indicated a desire to produce the

Case Number: 00537433 (Cont.)

device themselves. The outcome of this case is expected to be finalized in the next few months. Plans call for incorporation of the device into 1971 transport trailer models.

GFF:lj
5/12/70

Case Number: 90122290

A New York State bearing manufacturer is testing a lubricating device developed by NASA in a new automatic bearing lubrication system. If the tests are successful, the lubrication system could be incorporated into a new bearing design. The director of corporate research and development indicated that quite a bit of effort has been expended to date, but no benefit information could be determined at this time.

<u>Subject</u>	<u>Technology Source</u>
Lipe-Rollway Research and Development Center	Marshall Space Flight Center
Lipe-Rollway Corporation 4522 Wetzel Road Liverpool, New York 13088	Tech Brief: 68-10261, "Dynamic-Reservoir Lubri- cating Device"
Contact: Jack Armstrong Corporate Director of Research and Development	

The Lipe-Rollway Corporation is a major manufacturer of roller bearings. Such bearings are well suited for applications involving heavy loads. Jack Armstrong, director of Corporate Research and Development, ordered the NASA document to determine whether it could be used by his firm. A model of a roller bearing with this automatic lubrication concept was fabricated. It is now being used in an extensive series of tests. Such an evaluation program usually lasts several months. If the test results are quite favorable, the concept may be incorporated into designs of new bearings.

Armstrong felt that the major immediate benefit from the technology was the stimulation of in-house R & D efforts. He indicated that a considerable amount of time has been devoted to the project, but could not estimate the actual number of hours spent. Armstrong said that any new product coming out of this effort would not be developed very fast and that because of this, any benefit information regarding this transfer will not be known for quite some time.

GFF:ss
6/11/70

Case Number: 00432452

The Gulf Coast laboratory of a major oil company is testing NASA-developed tunable bandpass filters in a new electronic system. For proprietary reasons, an engineer in this firm could not reveal the specific nature of the new system; however, he did state that his use of the information had saved his project about \$1,500. The technology was developed by personnel at Ames Research Center.

<u>Subject</u>	<u>Technology Source</u>
California Company Division Chevron Oil Company 1111 Tulane Avenue New Orleans, Louisiana 70112 Contact: F. S. Bird Electronics Engineer	Ames Research Center Tech Brief: 69-10130, "Tunable Bandpass Filter With Variable Selectivity"

During development of a new system for the California Company Division of Chevron Oil Company, it was necessary that tunable bandpass filters be provided. Electronics engineer F. S. Bird ordered TSP 69-10130, "Tunable Bandpass Filter With Variable Selectivity," when this requirement became known to him. The technology, which was developed by Ames Research Center personnel, was useful to Bird. He stated that the general concepts contained in the TSP were incorporated into the filters built for the system.

While Bird could not reveal the application being made of the filters, he did indicate that it was a novel use of the device. He estimated that availability of this NASA-generated technology had saved the project about \$1,500. Some limited future savings may be realized, depending on the success of system performance tests that are now being conducted.

GFF:ss
4/15/70

Case Number: 81119765
 (Supersedes Telephone Follow-up of 7/15/69)

A large Ohio corporation may use NASA lubrication technology in a new turbine design. Previous plans to use this concept in another similar application were cancelled after design changes eliminated the need for the technique.

<u>Subject</u>	<u>Technology Source</u>
Clevite Corporation Mechanical Research Division 540 East 105th Street Cleveland, Ohio 44108 216-851-5500 Contact: LeRoy Owen, Jr. Metallurgist	Lewis Research Center Tech Brief: 67-10007, "Composites of Porous Metal and Solid Lubricants Increase Bearing Life"

In July 1969, Clevite Corporation planned to use the technology contained in a TSP, originally developed at Lewis Research Center, to produce a new bearing for truck and aircraft turbines. A brief market research effort along with further engineering evaluation of the proposed new product resulted in changes that eliminated the need for the improved lubrication process. Since that time there has been no further development activity.

Now, another possibility for a different high temperature turbine application has been proposed and a brief feasibility study may be conducted soon. The application is proprietary and therefore no further information could be obtained at this time.

GFF:lj
 5/6/70

Case Number: 00330506

A Midwestern industrialist has used the NASA "Contamination Control Handbook" to help develop standards for the National Fluid Power Association. The standards, which consist primarily of a complete glossary of terms related to contamination, will be used by the hydraulic power equipment manufacturing industry. The engineer responsible for preparing the standards stated, "We did not have to re-invent the wheel." The NASA document used in this effort was prepared by the Sandia Corporation for the Marshall Space Flight Center.

<u>Subject</u>	<u>Technology Source</u>
Rosaen Filter Division Parker-Hannifin Corporation 1776 East Nine Mile Road Hazel Park, Michigan 48030 Contact: Carl A. Brown Chief Engineer	Marshall Space Flight Center Tech Brief 68-10392, "Contamination Control Handbook"

The Rosaen Filter Division of Parker-Hannifin Corporation is a member of the National Fluid Power Association and has been engaged in the preparation of new standards that will be used by all participants in this organization. This company's task was to prepare a complete glossary of terms that are associated with contamination. Chief engineer Carl Brown requested TSP 68-10392, "Contamination Control Handbook," to assist in the effort. This NASA document was prepared by the Sandia Corporation for Marshall Space Flight Center.

Brown stated that the handbook was a considerable help in the preparation of their standards. The final document consisting of about ten pages of definitions for contamination terms is now being published. It will be followed by all association members to standardize contamination terminology used in the hydraulic power equipment industry.

The savings realized from the availability of the NASA technology could not be estimated. Brown simply stated, "We did not have to re-invent the wheel." In addition to the help in the preparation of the standards, the handbook will also be used by personnel in the company's laboratory.

GFF:kh
4/8/70

Case Number: 00532992

A small Minnesota electronics manufacturer used NASA technology in the preparation of a new computerized material control system. A company engineer used the concepts contained in a Tech Brief as background while laying out the computer program. The cost of implementing the system has been considered too high by management, so there has been no actual use made of it to date.

<u>Subject</u>	<u>Technology Source</u>
Tacronics Instruments, Incorporated 1500 North Front Street New Ulm, Minnesota 56073 507-354-3105 Contact: John T. McGraw Engineer, now at Mankato State College 507-389-1521	AEC-NASA Space Nuclear Propulsion Office Tech Brief: 67-10348, "Computerized Parts List System Coordinates Engi- neering Releases, Parts Control, and Manufac- uring Planning"

Tacronics Instruments, Inc. manufactures precision components for servo systems. Company management requested that engineer John McGraw move into the material control group and set up a computerized inventory system. He ordered the NASA document on this subject to help with that effort.

McGraw reported that the basic concepts contained in the TSP were incorporated into the computerized system. He estimated his use of the document saved about ten percent on the preparation time which could have been involved in the whole project. Despite the successful performance of the system, costs associated with actual implementation were considered too high by the firm's management; further development work has been terminated.

GF:ss
6/30/70



Case Number: 00433646

A Midwestern marketing representative for a large business machine company has provided NASA technology concerned with long range planning to his customer. The client is developing a revised planning system and this information may be incorporated into it.

<u>Subject</u>	<u>Technology Source</u>
International Business Machine Corporation Fort Wayne, Indiana 219-484-8676 Contact: Conner Loesch Marketing Representative	Manned Spacecraft Center Tech Brief: 67-10510, "Probabilistic Approach to Long Range Planning of Manpower"

IBM marketing representative Conner Loesch requested TSP 67-10510, entitled "Probabilistic Approach to Long Range Planning of Manpower," to see if this NASA technology might be of use to one of his client companies, Magnavox. That firm is currently developing a revised system for corporate planning. Loesch reviewed the document and since it was applicable to the problem, he turned it over to the client for possible incorporation into the new planning method. This development effort by Magnavox is currently being performed and the system is not expected to be completed until later this year.

Loesch does not know if the NASA technology will be used by Magnavox. If it is, there will certainly be a significant economic benefit. Some savings will be realized just by having the information, but no estimate of this amount could be made by Loesch. He did say that utilization of the technology would probably save thousands of dollars, but a more specific amount could not be determined at this time. Loesch also agreed that availability of the NASA information had saved him some time in providing assistance to his client. However, he was not able to estimate the amount of this benefit either.

GFF:ss
5/22/70

Case Number: 00433802

A Florida company official has used NASA-developed technology to improve his understanding of the parameters involved in long range forecasting. His firm is engaged in many small electronics projects and this makes it difficult to predict future requirements. He hopes that application of some of the techniques in the NASA document will make future forecasts more realistic.

<u>Subject</u>	<u>Technology Source</u>
Metric Systems Corporation 736 North Beal Street Ft. Walton Beach, Florida 32548 904-242-2111 Contact: James Bray Assistant Director of Manufacturing	Manned Spacecraft Center Tech Brief: 67-10510, "Probabilistic Approach to Long Range Planning of Manpower"

Metric Systems Corporation produces electronic data handling equipment and chassis in small quantities for a variety of customers. Assistant director of manufacturing James Bray ordered TSP 67-10510, entitled "Probabilistic Approach to Long Range Planning of Manpower," to see if it could help him with forecasting. Bray said that he had improved his background by studying the document and he now had a better understanding of the various parameters concerned with long range planning. He will be applying this information in the preparation of various company manpower forecasts and business projections. Bray now feels that he will be able to improve the accuracy of his inputs. Unfortunately, he could not give an estimate of past, or future, savings as a result of having used this NASA technology.

GF:ss
5/26/70

