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(NASA-CR-158027) STUDY OF FEDERAL TECHNOLOGY TRANSFER ACTIVITIES IN AREAS OF INTEREST TO NASA OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS Final Report (Battelle Columbus Labs., Ohio.) 140 p

N79-14945

G3/85 15324

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Report



FINAL REPORT

on

SURVEY OF FEDERAL TECHNOLOGY TRANSFER ACTIVITIES IN AREAS OF INTEREST TO NASA OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS

(Report No. BCL-OA-TFR-78-1)

by

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Sponsored by

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Office of Space and Terrestrial Applications
(Contract No. NASw-2800, Task No. 25)

January 30, 1978

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FOREWORD

The study reported herein was carried out by Battelle's Columbus Laboratories for the NASA Office of Space and Terrestrial Applications as a task under Contract No. NASw-2800. The work was done under the general supervision of Dr. A. C. Robinson, Battelle's manager for the contract. Task monitor in the Office of Space and Terrestrial Applications was Mr. Richard H. Weinstein, Code EK.

ACKNOWLEDGMENT

In the course of this study, a number of persons were contacted for information relative to specific Federal technology transfer activities. These contacts are referenced in Appendix B. The authors are most appreciative of the cooperation of these individuals. Without this cooperation, the study could not have been completed.

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A review of Federal activities in technology transfer was made to provide the Office of Space and Terrestrial Applications with current information relative to assessing the approaches and mechanisms through which NASA conducts technology transfer. Forty-three ongoing technology transfer programs in Federal agencies other than NASA were selected from over 200 current Federal technology transfer activities. Selection was made on the basis of compatibility with NASA technology, user groups, and specific technology transfer mechanisms utilized. Detailed information was obtained on the selected programs by reviewing published literature, and conducting telephone interviews with each program manager. Specific information collected on each program includes technology area, user groups, mechanisms employed, duration of program, and level of effort. A summary information sheet is provided for each program studied.

Twenty-five distinct mechanisms are currently employed in Federal technology transfer activities totaling $260 million per year. Typical applications of each mechanism were reviewed, and caveats on evaluating program effectiveness were discussed. A review of recent federally funded research in technology transfer to state and local governments was made utilizing the Smithsonian Science Information Exchange, and abstracts of interest to NASA were selected for further review.

INTRODUCTION

Expenditures during calander year 1978 for research and development in the United States are expected to reach $44 billion*, according

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* All monetary units in this report are in current year dollars.

to the annual R&D forecast produced by Battelle's Columbus Laboratories.[1]* Of this research, 53 percent will be funded by the Federal Government, 42 percent will be funded by industry, and the remainder will be funded by universities and other institutions. With a funding level of over $23 billion in R&D per year, the Federal Government has a tremendous responsibility to maximize the utilization of federally funded research.

Research actually performed by the Federal sector within Federal laboratories and throughout agency offices will total nearly $7 billion in 1978. This does not include amounts of research contracted by the Federal Government to industry and universities, which will total an additional almost $16 billion.

A 1975 report by the National Science Foundation[2] provides a breakout of formally budgeted technology transfer activities as a function of federally performed R&D, shown in Table 1. Actually, the Federal Government funded $18.2 billion of research in 1975, so it is reasonable to compare formally budgeted technology transfer activities with the total research funded by the Federal sector, instead of just the research performed by the Federal sector. On this basis, formally budgeted Federal technology transfer activities are 1.3 percent of federally funded R&D.

Because of the unique nature of the agricultural extension service as a technology transfer/research utilization (TT/RU) agent, it is useful to consider the data presented in Table 1 without this $200 million activity. (The agricultural extension service is discussed in a later section.) Removing a $1 billion agriculture funding level from the $18.2 billion level of 1975 Federal R&D funding gives a total Federal R&D expenditure of $17.2 billion. Without agriculture, formally budgeted technology transfer activities total $31 million, or less than 0.2 percent of research expenditures. It must be recognized, however, that technology transfer activities frequently exist in R&D programs as other than formally budgeted programs. Informal programs include such activities as dissemination activities built into the R&D project itself and R&D performance by the sector adapting the technology. In Battelle's opinion, informal technology transfer activities account for a higher percentage of Federal R&D expenditures than the formal TT/RU effort indicated in Table 1. Based

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* Superscript numbers refer to references found at end of text. The reference list is followed by a Bibliography citing the numerous publications utilized in this survey.

TABLE 1. PROPORTION OF FY 1975 R&D BUDGET ALLOCATED FOR TECHNOLOGY TRANSFER/RESEARCH UTILIZATION, BY AGENCY[2]

Agency	R&D Budget[a] millions of dollars	TT/RU Budget[b] millions of dollars	TT/RU as Proportion of R&D, percent
USDA	$ 428[c]	$200[d]	47
FHWA	17[e]	3.3	19.4
LEAA	33[e]	4.5	13.6
NIE	55[e]	5.5	10
NSF	83[c,f]	8[f]	9.6
DOL	15[e]	0.5	3.3
NIMH	93[e]	1.8	1.9
HUD	58[e]	0.35	0.6
EPA	287	1.3	0.45
NASA	3,327[c]	5.5	0.17
MCS	100[e]	0.1	0.1
DOE (ERDA)	712[c,g]	0.5	0.07
TOTAL	$5,208	$231.35	4.4

(a) Source: FY 1976 Budget, Special Analysis F and Appendix, except where noted.
(b) Does not include demonstration funds where these could be identified. Program funds only.
(c) Source: Special Analysis F, FY 1976 Budget Submission.
(d) Federal funds only.
(e) Source: Agency officials.
(f) RANN (Research Applied to National Needs) program only.
(g) Conduct of R&D: nuclear agency development.

on the results of this survey, informal technology transfer activities are estimated to be nearly an order of magnitude greater than formally budgeted technology transfer programs, exclusive of the agricultural extension program. Later in this report (Table 2) $260 million of Federal expenditures on technology transfer in areas of interest to OSTA will be identified.

STUDY OBJECTIVES

Because many technology transfer activities undertaken by the Federal sector are not formally reported as line items in agency budgets, it is difficult to obtain a perspective on the extent and types of activities occurring in various agencies. A complete picture of technology transfer activities can be gained only by reviewing the activities of various agencies to determine which administrations/offices are conducting specific technology transfer activities and, in turn, contacting the offices of program directors to obtain accurate firsthand information.

The Office of Space and Terrestrial Applications (OSTA) within NASA is deeply involved in technology transfer activities both to the public and private sectors. Because of this involvement, NASA is seeking to more fully utilize the existing base of experience currently available to OSTA through existing programs in the Federal sector. OSTA is interested in determining both the extent of technology transfer efforts and the specific mechanisms which are being utilized by other Federal agencies, and in determining possible outlets for NASA technology augmenting NASA's own technology transfer efforts. To provide information essential to such a determination, Battelle was asked to undertake the task order presented in Appendix A.

The primary thrust of the effort was a review of existing technology transfer programs within the Federal structure to obtain first-hand information on mechanisms used, budget, involvement of industry and universities in the various programs, the applicability of the programs to OSTA technology, and state and local government involvement. The task monitor specified that the principal emphasis should be placed on raw data collection (Item 1 of the task order agreement).

STUDY METHODOLOGY

The study plan for this task was primarily focused on identifying technology transfer programs in the Federal Government of interest to OSTA and on interviewing key agency personnel to obtain necessary information. The study plan included the activities described in the paragraphs that follow.

Federal Technology Transfer Program Review

The review of Federal technology transfer programs was designed so that the following activities would be undertaken sequentially:

(1) Identify all Federal agency programs involved in technology transfer activities, ranging from simple information transfer to more complex activities.

(2) Determine which of these programs should be investigated in detail with respect to:

  (a) The applicability of mechanisms utilized to OSTA activities

  (b) The compatibility of the technologies transferred with the interests of OSTA

  (c) Emphasis on state and local governments involved.

(3) Identify the program manager, office director, or other high-level contact familiar with both the program and its relationship to other agency activities.

(4) Interview the contact via telephone and organize information obtained in a standard format.

(5) Summarize the information obtained per Item 2 of the task order.

Identification of Federal Programs in Technology Transfer

The 1977 (June) Directory of Federal Technology Transfer[3] was used to review the technology transfer activities of each agency of the Federal Government. Discussion within Battelle, with NSF, and with Dr. A. B. Linhares of DOT, who was instrumental in developing the directory, indicated that the directory was fairly complete in listing what each agency considers as its technology transfer activities. The directory is a compilation of information on over 200 programs and offices involved in one form or another of technology transfer. In addition to the directory, many agency brochures and annual reports were reviewed for information on technology transfer efforts. Though the directory was a useful tool in initiating the task, the following difficulties existed in utilizing directory information relative to task objectives:

(1) The programs included a wide range of interests from energy development to alcohol abuse, many of these areas being outside the scope of OSTA's immediate interest.

(2) Some of the contacts provided in the directory lacked the perspective of the technology transfer activities related to the agency's objectives.

(3) The mechanisms and organizational arrangements applied in the technology transfer activity were often not clearly identified.

(4) The target or user groups were not always identified, nor were means of involvement stated.

(5) Budget and manpower figures were generally not presented.

(6) The information provided a broad overview of agency programs but did not approach technology transfer at the project level.

Determination of Programs of Interest to OSTA

Using the directory and available descriptive program literature, a compilation of programs of interest to OSTA was conducted. According to the task guidelines, programs were selected on the basis of the technology transferred, the involvement of state and local governments, and also on the basis of mechanisms which are of potential interest to OSTA. From the over 200 programs in the directory, 43 were selected for further investigation. NASA activities were not included in the survey.

Specific technology areas believed to be of interest to OSTA on the basis of current or prior initiatives include:

- Weather, Climate, Environmental Quality
  - Forecasting
  - Pollution Monitoring/Sewage Treatment
  - Ocean Dynamics Applications
    - Ship Routing
    - Offshore/Underwater Operations
    - Oceanography
  - Remote Sensing
- Earth Resources
  - Forrestry/Timber/Timber Products
  - Agriculture and Products
  - Ecology
  - Remote Sensing
  - Hydrology
  - Geology, Petrology, Exploration, Mining
- Earth Dynamics
  - Geology
  - Geodesy, Gravitational Field
  - Magnetic Field Studies
  - Seismology, Vulcanology
- Communications - Communications (Effectiveness) Research
- Space Processing
  - Materials Research
  - Metallurgy
  - Manufacturing Technology
  - Vacuum Technology.

Other technology areas generally related to NASA activities include:

Structures and Structures Analysis
Combustion Chemistry, Thermodynamics
Energy Conversion and Storage
Medical Technology and Instrumentation
Food Technology
Fire Prevention/Control.

Technology transfer programs listed in the directory which were not considered applicable to the current task include those in the fields of economics, social science, labor, and other soft sciences.

Identification of Correct Contacts

The contacts listed in the Federal Directory of Technology Transfer were often listed as mailing addresses or box numbers. In some cases, the phone numbers provided were incorrect. In several cases where the contact was reached with the phone number provided, the contact was at a level in the organization unable to provide the perspective of technology transfer activities in relationship to the agency's objectives. In order to properly conduct phone interviews and obtain accurate information on the 43 programs, the Federal Organization and Personnel Directory[4] was used to obtain the names of office directors or administrators in the bureau or administration conducting the program. The high level contacts then were used to positively identify the program managers. In several cases, discussions were conducted with both levels. The program or office managers providing detailed information are listed on each program summary sheet in Appendix B.

Conduct of Phone Interviews

Once the proper individuals had been identified, phone interviews were conducted to develop the information specified in the task order. Specifically, the following data were collected for each program:

1. Agency. The agency conducting the program.
2. Bureau/Administration. The component within the agency conducting the program.
3. Office/Program. The specific office and/or program responsible for the technology transfer activities.
4. Technology Fields. The areas of technology in which the transfer programs operate. Examples are marine ecology, coastal development, fire safety or, in the case of some programs, federally sponsored research in any technology area.

5. Products Transferred. The actual object of the transfer effort. Examples are information such as research abstracts, techniques such as the proper utilization of a new stress analysis method, and hardware such as a new machine or device. Other products include patents, medicines, and so on.

6. Applicability to OSTA. The over 200 programs in the Federal Technology Transfer Directory were reduced to 43 for further investigation on the basis of applicability to OSTA. No phone inverviews were conducted on those programs deemed to have little applicability to OSTA initiatives. Applicability was based primarily on technology area, state and local government involvement, and mechanisms used. Examples of applicability due to the technology transferred include transfer activities in technology areas such as land use planning, fire safety, medical devices, and other areas of known NASA involvement. Examples of potential applicability due to the technology transferred include such areas as marine ecology, patents, measurement, and other areas peripherally related to NASA's programs, as outlined earlier. Programs directly involving technology transfer to state or local governments were viewed as applicable because of OSTA's focus on state and local activities. Programs utilizing mechanisms such as conferences or workshops or other mechanisms deemed suitable to NASA programs were also viewed as applicable.

7. Mechanisms. The mechanisms actually used in the transfer process. Examples include conferences, workshops, data bases, and cooperative R&D efforts. A complete listing if presented later in Table 3. In several cases, the technology transfer program was an integrated set of activities requiring some background explanation. In these cases, background on the program, objectives, and specific activity areas are provided.

8. Universities. The role of universities in the technology transfer program.

9. Industry. The role of industry in the technology transfer program.

10. Principal Users. The primary target groups of the technology transfer effort.

11. Duration. The number of years the program has been in effect.

12. Scope. The budget of the program. Where several related activities were conducted, budget information

for each activity was collected as available. Most of the data are reported in office budget numbers which include total dollars for both program funds and staff. The number of the staff is reported as well in some cases. Some budget data were reported in program funds only, i.e., the budget amount does not include staff. In some cases, the budget information is expressed as dollars plus full-time staff, since both the staff and program funds must be considered to determine the scope of the program.

Examples:

(1) "Scope is $13 million per year which includes a staff of 25 people." In this case, the scope is $13 million total which covers both program funds and staff support.

(2) "Scope is $3 million annually plus 13 full-time staff." Here, the budget is $3 million in program funds plus the expenses associated with a full-time staff of 13 (or about $3.6 million in total, allowing $50,000 for each staff member/year). In some cases, interagency support, support from other offices within an administration, and other external sources of funds also contribute to the program scope, over and above the actual budget for the program. Some programs are actually seed money which cause far greater resources to be applied than the office budget indicates. In these cases, the relationships to external sources of funds are dicusssed where possible.

13. Contact. The person contacted, together with current phone number for ease of follow-up.

Summarization of Information Obtained

The information obtained was formatted to fit summary sheets that had been designed for this survey. The summary sheets for each program are presented in Appendix B.

Federal Technology Transfer Research Project Review

In addition to reviewing ongoing Federal Agency programs in the area of technology transfer, it was determined that a review should be made of ongoing research projects throughout the Federal Government in the field of technology transfer to state and local governments. This

would provide information on specific projects and level of effort in technology transfer not obtainable by review of specific Federal programs. To accomplish this review, a September 1976 report[5] developed for Battelle by the Smithsonian Science Information Exchange was utilized. The report is a computer search of recently completed and ongoing research under the heading "Current Federal Programs in Technology Transfer to State and Local Governments". The project abstracts were reviewed to determine which projects were of potential interest to OSTA, and summary information was developed. A listing of selected project abstracts appears in Appendix C.

RESULTS

Federal Technology Transfer Programs

Scope of Federal Technology Transfer Activities

The range of Federal technology transfer activities is extensive, from the complex $200 million per year agricultural extension service to specific projects such as the Los Angeles Chamber of Commerce industrial technology transfer program funded at $150,000 by the Office of Technical Assistance within the Economic Development Administration of the Department of Commerce. The major output of this task, specific data on the technology transfer programs of interest to OSTA, is reported in detail in Appendix B. The programs reported in Appendix B reach across 12 agencies, 29 administrations, and 43 offices and programs. Of particular interest to OSTA, 22 of the programs studied have specific industrial involvement, 21 have specific state and local government involvement, and 25 of the programs have activities involving universities. Table 2 shows the technology transfer budgets of the agenices and administrations studied. Data on specific programs are presented in Table B-1 of Appendix B.

Care should be exercised in use of funding figures, since the definition of technology transfer varies by program. For example, the $30 million per year Sea Grant program could be broadly interpreted as technology transfer or narrowly interpreted as R&D performance with no

TABLE 2. FEDERAL TECHNOLOGY TRANSFER ACTIVITIES OF INTEREST TO OSTA

Agency	Administration	Funding[a], 1977 $
COMMERCE	Economic Development Administration	3,400,000
	National Bureau of Standards	13,480,000
	National Fire Prevention and Control Administration	2,750,000
	National Oceanic and Atmospheric Administration	75,800,000
	National Technical Information Service	16,000,000
	Patent and Trademark Office	35,000,000
	U.S. Maritime Administration	20,000,000
DEFENSE	Federal Technology Transfer Consortium	25,000,000
ENERGY	Office of Conservation	Undetermined
	Environment and Safety	Undetermined
	Fossil Energy	Undetermined
	Technical Information Service	Undetermined
	Solar, Geothermal, and Advanced Systems	2,500,000
ENVIRONMENTAL PROTECTION AGENCY	Technology Transfer Office	3,000,000
HEALTH, EDUCATION AND WELFARE	National Institute of Health	1,000,000
	Public Health Service	Undetermined
HOUSING AND URBAN DEVELOPMENT	Policy Development and Research	600,000
	Directors Office	10,000,000
INTERIOR	Library and Information Service	500,000
	U.S. Fish and Wildlife Service	800,000
	U.S. Geological Survey	17,000,000
	Bureau of Mines	250,000
	Water Research and Technology	2,200,000
JUSTICE	Law Enforcement Administration	10,000,000
NATIONAL SCIENCE FOUNDATION	Research Applications Directorate	6,500,000
SMALL BUSINESS ADMINISTRATION	Office of Technical Assistance	1,000,000
TRANSPORTATION	Various Administrations	Undetermined
SMITHSONIAN INSTITUTION	Smithsonian Science Information Exchange	13,000,000
TOTAL		259,750,000

(a) Refer to Table B-1 for further detail by program. Program data sheets in Appendix B provide specific definition of funding elements.

technology transfer. Actually, technology transfer is an inherent goal of the overall Sea Grant program. Specific information on each program is provided in Appendix B to clarify funding definitions. In some cases, additional manpower or other resources from within an agency or even external funds are available to the program, so caution should be exercised in the use of funding figures. The data in Table 2 are useful primarily for providing an indication of the extent of technology transfer in various administrations. Comparison of Table 2 with Table 1, formal technology transfer budgets by agency, indicates that technology transfer activities of interest to OSTA are at least an order of magnitude greater than formally budgeted technology transfer activities of various agencies.

Mechanisms of Interest to OSTA

Review of the programs outlined in Appendix B reveals an extensive range of mechanisms applied in Federal technology transfer programs. The major mechanisms are discussed in this section, where the mechanism is described and the primary application of each mechanism is indicated. Table 3 presents an overview of the mechanisms used, and the frequency of application in the programs studied. Twenty-four distinct mechanisms were identified. Table 4 provides a matrix tabulation of the programs studied and the different mechanisms used.

Publications, conferences and symposia, clearinghouses and information centers, R&D funding, and cooperative projects were the most frequently utilized mechanisms, while some of the least frequently used were exhibits and trade shows, equity capital, and procurement regulations. Each mechanism is discussed below, and examples are given of typical applications.

Advisory groups include information user panels, steering committees made up of diverse interests, and similar groups. This mechanism is used primarily to provide user inputs to ongoing research activities of moderate to large scale, where a variety of interests are represented. An example is the use of advisory panels in the NOAA MESA New York Bight project.

Associations and societies are useful in representing otherwise diverse industrial or scientific community interests on specific topics.

TABLE 3. MECHANISMS USED IN FEDERAL TECHNOLOGY TRANSFER ACTIVITIES OF INTEREST TO OSTA

Technology Transfer Mechanisms	Number of Programs Studied Using Mechanisms
Advisory Groups	4
Associations and Societies	7
Audiovisual Materials	4
Brokers and Transfer Agents	10
Clearinghouses and Information Centers	20
Computer Data Banks	13
Conferences, Seminars and Workshops	19
Cooperative Projects	19
Counterpart State Agencies	13
Demonstration Projects	14
Equity Capital	1
Exhibits and Trade Shows	2
Expert Assistance	15
Mail Solicitation	3
Patent Licensing	4
People Transfer	3
Procurement Practices	1
Publications	23
R&D Funding	25
Reader Service Cards	1
Regional Centers/Offices	10
Regulatory Mechanisms	5
Standards	4
Training Schools	5

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TABLE 4. MATRIX TABULATION OF PROGRAMS SI

Page[a]	Agency	Bureau/Administration	Program	Advisory Groups
B-5	Commerce	Economic Development Administration	University Center Program	
B-6	Commerce	Ditto	Connecticut Product Development Corporation	
B-7	Commerce	"	Massachusetts Science and Technology Foundation	
B-8	Commerce	"	NEUS, Incorporated	
B-9	Commerce	"	Los Angeles Chamber of Commerce	
B-10	Commerce	National Bureau of Standards	Experimental Technology Incentives Program	
B-11	Commerce	Ditto	Research Associates Program	
B-12	Commerce	"	Standard Reference Data Program	
B-13	Commerce	"	Standard Reference Materials Program	
B-14	Commerce	"	Office of Weights and Measures	X
B-16	Commerce	National Fire Prevention and Control Administration	Fire Safety and Research Office	X
B-18	Commerce	National Oceanic and Atmospheric Administration	Coastal Zone Management Office	
B-20	Commerce	Ditto	Environmental Data Service	
B-22	Commerce	"	Marine Ecosystems New York Bight	X
B-24	Commerce	"	National Marine Fisheries Service	
B-26	Commerce	National Oceanic and Atmospheric Administration	Office of Marine Technology	

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UDIED AND TECHNOLOGY TRANSFER MECHANISMS USED

Associations and Societies	Audiovisual Material	Brokers and Transfer Agents	Clearinghouse and Information Centers	Computer Data Banks	Conferences, Seminars and Workshops	Cooperative Projects	Counterpart State Agencies	Demonstration Projects	Equity Capital	Exhibits and Trade Shows	Expert Assistance	Mail Solicitation	Patent Licensing	People Transfer	Procurement Practice	Publications	R&D Funding	Reader Service Cards	Regional Centers/ Offices	Regulatory Mechanisms	Standards	Training Schools
		X	X	X							X								X			
									X		X											
			X	X							X											
														X								
		X		X																		
						X									X		X			X		
														X								
		X	X													X	X					
																					X	
X					X		X														X	X
					X	X					X					X	X			X		
							X				X					X	X			X		
		X	X	X															X			
						X	X	X									X			X		
X					X	X					X						X		X			
						X					X					X	X					

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TABLE 4.

Page[a]	Agency	Bureau/Administration	Program	Advisory Groups
B-27	Commerce	National Oceanic and Atmospheric Administration	Geodetic Survey (New Initiative)	
B-28	Commerce	Ditto	National Ocean Survey, Distribution Branch	
B-29	Commerce	"	Office of Ocean Engineering	
B-31	Commerce	"	Office of Sea Grant	
B-32	Commerce	National Technical Information Service	Inquire Service and TT Programs	
B-34	Commerce	Patent and Trademark Office	Patent Information and Special Reports	
B-35	Commerce	U.S. Maritime Administration	MarAd Research and Development Program	
B-36	Defense	DoD Laboratories	Federal Technology Transfer Consortium	
B-37	Energy	Office of Conservation	Division of Industry	
B-38	Energy	Environment and Safety	Office of Planning	
B-39	Energy	Fossil Energy	Various Programs	
B-41	Energy	Technical Information Services	Technical Information Center	
B-42	Energy	Solar, Geothermal and Advanced Systems	Technology Transfer Branch	
B-44	Environmental Protection Agency	Technology Transfer Office	Environmental Research Information Center	
B-45	Health, Education and Welfare	National Institutes of Health	Medical Applications Research Office	X

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(Continued)

Associations and Societies	Audiovisual Material	Brokers and Transfer Agents	Clearinghouse and Information Centers	Computer Data Banks	Conferences, Seminars and Workshops	Cooperative Projects	Counterpart State Agencies	Demonstration Projects	Equity Capital	Exhibits and Trade Shows	Expert Assistance	Mail Solicitation	Patent Licensing	People Transfer	Procurement Practice	Publications	R&D Funding	Reader Service Cards	Regional Centers/ Offices	Regulatory Mechanisms	Standards	Training Schools
X			X		X	X	X									X			X			
		X										X				X						
X			X		X											X	X					
					X			X								X	X					
			X	X	X	X					X	X	X									
		X	X										X									
						X											X					
		X	X	X												X	X					
					X	X		X			X		X			X	X					
					X											X	X					
					X	X		X					X			X	X					
			X	X	X																	
			X			X		X		X						X	X					
X	X	X	X			X	X	X								X	X		X	X	X	
X	X				X			X								X	X					

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TABLE

Page[a]	Agency	Bureau/Administration	Program
B-47	Health, Education and Welfare	Public Health Service	Health Services Administration
B-49	Housing and Urban Development	Policy Development and Research	Product Dissemination and Transfer
		Director's Office	Technical Assistance to State and Local Governments
B-52	Interior	Library and Information Services	Natural Resources Information System
B-54	Interior	U.S. Fish and Wildlife Service	Biological Service Office Information Transfer Project
B-57	Interior	U.S. Geological Survey	Land Information Analysis Office
B-60	Interior	Bureau of Mines	Mining Research Technology Transfer Group
B-63	Interior	Water Research and Technology	Technology Transfer Program
B-65	Justice	Law Enforcement Administration	Technology Transfer Division
B-68	National Science Foundation	Research Applications Directorate	Research Applied to National Needs
B-71	Small Business Administration	Office of Technical Assistance	Technology Assistance Program
B-73	Transportation	Various Administrations	
B-77	Smithsonian Institute	Smithsonian Science Information Exchange	Research Abstracts Service
			TOTAL 4

(a) Page numbers reference program descriptions in Appendix B.

(Continued)

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Societies	Audiovisual Material	Brokers and Transfer Agents	Clearinghouse and Information Centers	Computer Data Banks	Conferences, Seminars and Workshops	Cooperative Projects	Counterpart State Agencies	Demonstration Projects	Equity Capital	Exhibits and Trade Shows	Expert Assistance	Mail Solicitation	Patent Licensing	People Transfer	Procurement Practice	Publications	R&D Funding	Reader Service Cards	Regional Centers/ Offices	Regulatory Mechanisms	Standards	Training Schools
							X	X									X					
	X	X			X	X	X				X					X	X					
					X		X	X								X	X					
			X	X																		
			X	X			X									X	X		X			X
					X	X		X			X					X	X		X			X
X						X	X	X		X	X					X			X			
			X	X	X	X	X									X	X					
	X		X		X	X	X	X			X			X		X					X	X
		X	X		X	X		X			X					X	X					
			X	X							X	X						X	X			
			X	X	X	X	X	X								X	X		X			Y
			X	X																		
7	4	10	20	13	19	19	13	14	1	2	15	3	4	3	1	23	25	1	10	5	4	5

Since associations have established two-way communication with their constituency, they can serve to both focus user needs and requirements, and disseminate information and techniques. The development of the universal product code by the Grocer's Association, and subsequent representation in the National Conference of Weights and Measures, made possible the adaptation of optical label scanning in supermarkets. Associations typically have various working groups such as standards committees active in specific technology areas (A.S.M.E. Pressure Vessel Code, for example). These committees, through the association, are able to rapidly disseminate relevant technological advances, and recommend the direction of further research efforts which represent the needs of the constituency.

Audiovisual materials are primarily used as information and training tools and serve to bridge the gap between printed information and personal assistance. The technology transfer program of the Law Enforcement Administration, for example, uses audiovisual material in education and training. These tools are also applicable to technical and scientific information exchange, and have been used by NASA, for example, to demonstrate crystal growth phenomena in microgravity (space processing).

Technology brokers and transfer agents can be specialists in the technology being transferred, or generalists. Their use depends on such factors as technical competence, political experience, knowledge of a particular state/local political situation, and other factors. In some cases, the transfer agent is also the R&D performer. Typically, an agent is employed to gain access to markets with which the technology developer had little or no direct experience or where the developer has no local resources to apply, such as a local or regional office. An example of the use of a technology transfer contractor is the use of Public Technology Incorporated by the HUD Division of Product Dissemination and Transfer. Several of the programs studied utilized universities as agents in the operation of information centers.

Clearinghouses and information centers are widely used throughout the Federal Government. These facilities may or may not be automated, and are generally response-oriented (passive). Information centers are almost always discipline-oriented. Examples include the Water Research and Technology Information Service (Interior), Automated Law Enforcement

Abstracts (Justice), Technical Information Center (Energy), and several others. Some information centers such as the Natural Resources Library (Interior) are linked to a multidisciplinary network of over 60 specialized information data banks.

Computer data banks provide access to a wide range of research projects, results and publications in almost every field of technology. Typically, the data banks are accessed by subject, and represent a passive technology transfer mechanism. In addition to many automated data banks maintained as part of various discipline-oriented clearinghouse and information centers, some national data banks such as the National Technical Information Service contain abstracts on all federally funded research projects. The Smithsonian Science Information Exchange contains abstracts on all Federal research in progress. Other data banks such as the Transportation Research Information System managed by Battelle's Columbus Laboratories for the Department of Transportation contain a diverse range of technical information. Regional offices of programs such as the EDA University Centers Program allow walk-in access to many interconnected data banks.

Conferences, symposia and workshops are widely used to bring together diverse interests on a specific topic. The National Conference on Weights and Measures, for example, brings together associations, regulatory officials, industry representatives and other groups related to trade measurement. The legal and regulatory standards and other issues surrounding electronic measurement devices (scales) were worked out by the National Conference on Weights and Measures, and made possible the adaptation of electronic weighing devices. Further, through the various working subcommittees of the conference, inputs are made to the research efforts of the National Bureau of Standards Weights and Measures Programs. A closed loop exists between research efforts and the conference, which tends to provide a focus on user needs in NBS research activity and ensure utilization of research results. It should be noted that NBS has no regulatory jurisdiction over weights and measures, which is a state agency function. The conference mechanism has served to facilitate interaction between state regulatory, consumer, and industry groups.

Cooperative research projects are used by a number of agencies as a primary technology transfer mechanism. Examples include the Bureau of Mines (Interior), the Maritime Administration (Commerce), and National

Science Foundation state legislative and state government programs. A typical Bureau of Mines project is the recovery of aluminum by leaching, funded by 10 aluminum companies at $50,000 each, and $1 million from the Bureau. Since the end user pays a part of the costs, research tends to be directed toward real problems of the user, and results tend to be utilized. The NSF programs are directed at technical inputs to planning in state government and state legislature. In these programs each state receives $50,000, matched by $25,000 in state funds. Many other Federal programs utilize various forms of sharing, ranging from R&D performance to payments in kind such as manpower, of the use of equipment.

Counterpart state agency activities are used in a number of the Federal technology transfer programs studied. The state agencies closely share the R&D interests of the Federal agency, and serve both to focus research efforts and provide a central point for technology utilization. Examples include Law Enforcement Agency programs, Environmental Protection Agency programs, Housing and Urban Development programs, and others. Where counterpart state agencies exist, a major path for technology diffusion is from the technology developer to the counterpart Federal agency, and then to the state agencies and local governments. The counterpart Federal agency provides momentum and a focal point for the transfer activities.

Demonstration projects in the programs studied are widely used to disseminate technology both to industry and to state and local governments. The goal of such projects is to gain hands-on experience with the new technology in a real environment, and use the successful results to "sell" other user groups on the technology. The planning and management research program of the National Fire Safety and Research Office uses case histories of fire management practices in various cities to demonstrate the effectiveness of advanced fire-management techniques. The Public Health Service, for example, has funded several health care demonstration projects, including ones involving use of the ATS-6 satellite. Other demonstration projects range from resource management to hardware development programs.

Equity capital was used as a primary technology transfer mechanism in one program studied. The Economic Development Administration within Commerce provided support to the Connecticut Product Development Corporation. The program objectives were to identify potential innovative high technology

products and provide equity funding of the product development with selected companies. No other programs surveyed used this mechanism. It should be noted that the company will soon become self-supporting on a $10 million state bond issue, and should achieve self-sufficiency through royalty payments by 1979. It might be noted further that Battelle's recent recommendations to the House Committee on Science and Technology (Rep. Fuqua) suggested that this mechanism was underutilized by the Federal sector, and is an important driver in technology transfer to the industrial sector.

Exhibits and trade shows were mentioned as a mechanism in at least two of the programs studied, the Solar, Geothermal and Advanced Energy Systems Division of the Department of Energy, and the Mining Technology Group of the Bureau of Mines, Department of Interior. This mechanism is most applicable to hardware developments, and is principally used in industrial transfer activities.

Expert assistance is used as a mechanism in several of the programs studied in both industry and state and local government programs. This mechanism appears in a variety of forms. The Economic Development Administration University Centers Program provides one-on-one technical counseling to small businesses to define specific technical problems. Scientific personnel are then located within the Federal Government as technology information sources. The National Bureau of Standards provides assistance to state agencies in weights and measures laboratory design. The National Fire Prevention and Control Administration provides expert assistance to firefighters and city managers. The NOAA coastal zone management office assists states in designing coastal zone planning programs. The Geodetic Survey assists state survey agencies in geodetic technology. Many other examples are indicated on the summary sheets in Appendix B. In a large percentage of cases, the expert assistance is provided by Federal agencies to either counterpart state agencies, or to state or city government units directly or indirectly involved with the conduct of the Federal agencies' primary mission (e.g., National Fire Prevention and Control Administration is directly involved with city governments in all areas of fire safety).

Mail solicitation and reader response cards are both employed by the Small Business Administration to create awareness of its technology assistance program. This is one of the few programs surveyed using these techniques. A pamphlet outlining the program objective is mailed to small

businesses selected from industrial directories such as the Dunn & Bradstreet directory, and the interested businessman responds with a postcard. Personal contact is then made by one of the regional program representatives. Mail solicitation is primarily useful for generating private sector awareness of products and services. Reader response cards are useful for maintaining lists of persons/organizations interested in specific technology areas, and as a means of selectively disseminating additional information through mailings or personal followup.

Patent licensing is used as a technology transfer mechanism in at least three of the programs studied. A major licensing program has been operated by NTIS since 1973. In this program, government-owned patents are screened, and seminars held to expose potentially interested industry to selected inventions. Contractors are used to set up the conferences. Direct mail and telephone solicitation are used as well, to stimulate industrial interest in potential licensing arrangements. The overall goal of the program is to achieve utilization of federally developed technology. Patent transfer and licensing are primarily oriented toward technology transfer to the private sector.

People transfer is regarded by some experts as the most effective technology transfer mechanism available. One of the major Federal programs studied involving people transfer with the industrial sector is the Research Associates Program of the National Bureau of Standards. In this program, industrial associates work at NBS on defined problems of mutual interest. The sponsoring company pays the associate's salary, while NBS provides research facilities and related support. Seventy-six associates are currently active in the program, which has been in operation since 1921. Many other programs involve personnel exchange between Federal agencies and state and local governments. The Law Enforcement Technology Transfer program, for example, provides funds for observers to learn the techniques of new programs in other cities. As an example, San Francisco recently sent observers to New York to examine its street crime unit, and subsequently established a unit in San Francisco with notable success.

Procurement practices designed to impact technology transfer comprise one of the goals of the Experimental Technology Incentives Program (ETIP) of the Bureau of Standards. By specifying life-cycle costing, the program

was able to advance a certain air-conditioning technology. Though unit cost was higher, life-cycle costs, including energy input, were lower. By selective procurement practice reform, similar technologies could be advanced.

Publication was the most widely used dissemination mechanism in all the programs studied. Publication activities included research reports, technology assessments, program summaries, annual reports, papers, journals, articles, newsletters, manuals, planning guides, special reports of all types, and other literature too numerous to detail. There are several publications which are guides to further publications in selected fields. Nearly any potential user group in any sector can be reached by publication in selected journals and trade magazines. Publication also remains the principal mechanism of scientific information transfer. Though widely employed, publication remains primarily a passive technology transfer mechanism.

R&D funding was employed in several of the programs studied, as well as specific activities in technology transfer. In many cases the performing sector was the target of the technology transfer effort, and the R&D funds themselves could be considered a form of technology transfer. This is particularly true in co-sponsored projects as previously discussed. Federal R&D often provides seed money essential to the process of technology transfer in the industrial sector, since the R&D performer can experiment and develop new techniques and devices with little financial risk. The knowledge gained in the R&D effort may be widely applicable to other aspects of the performers' operations. The great amount of material written on the importance of Federal R&D to technological advancement indicates that the linkages between R&D funding and technology transfer are extremely complex.

Regional centers and offices were used as mechanisms in several of the programs studied. The University Centers program of the Economic Development Administration has a network of 20 university centers, and is currently expanding to 35 centers for walk-in assistance. The National Bureau of Standards (NBS) Reference Data Program utilizes a network of 20 data centers in specialized fields of excellence, while the Resource Utilization Group of the National Marine Fisheries Service operates a network of five regional centers, concentrating on specific activities indigenous to each region. The National Geodetic Survey utilizes a system of field offices throughout the country, the Patent Office operates a network of 27 geographically dispersed Patent Depository Libraries, and the Environmental Protection

Agency operates 10 regional offices. A network of seven regional offices to provide ecological inputs to state and industry development activities is currently being established by the Fish and Wildlife Services Information Transfer Program. The Office of Water Research and Technology within Interior operates a university program involving 54 state and territorial universities. Several other regional centers programs were noted as well. Regional centers tend to be used to either accomplish geographic dispersion where proximity with users or potential users is important for ease of interaction, or because the activities of the program vary by region due to local conditions and regional emphasis. Geographic dispersion is primarily associated with services addressing the private sector, while regional or local program emphasis is typically a feature of programs involving state and local governments.

Regulatory mechanisms are employed in a few of the programs studied. Examples of the use of regulatory impact to stimulate technology transfer include setting environmental standards in areas such as municipal and industrial waste control. A number of Federal technology transfer programs provide technical assistance to state and local regulatory agencies and decisionmakers, who in turn establish regulatory policy. Areas of technical assistance noted ranged from land use to health care, and fire code enforcement.

Standards and codes can be used to stimulate technology transfer. The National Bureau of Standards operates a number of technology transfer programs under the general category of standards development. Engineering and physical science properties of materials are studied and widely disseminated. Standard reference materials are produced and distributed. Measurement standards are maintained, and new measurement technology is advanced through the development of uniform codes and standards. Uniformity in building codes is developed. Utilization of a new technology may be critically dependent on inclusion in codes and standards. NASA's (Marshall) experience with getting flat power cables written into the National Electric Code is an example.

Training programs were utilized as technology transfer mechanisms in some of the programs studied. Typically, training schools are used to update and maintain the skills of state and local agencies involved in the conduct of a specific operating functions such as fire safety, weights and

measures enforcement, law enforcement, etc. In these cases, the Federal agency has either a regulatory or an enabling legislative charter in the field.

OSTA Utilization of Technology Transfer Mechanisms

During the conduct of telephone interviews of technology transfer program managers throughout the Federal sector, it became apparent that NASA was clearly regarded as a leader in technology transfer. At least ten of the mechanisms used in Federal technology transfer activities are currently/ widely used by NASA. These include advisory groups (such as the Space Applications Board of the National Academy of Engineering), associations and societies (such as AIAA), clearinghouses and information centers (such as the technology utilization University Centers Program), computer data banks (NASA formerly operated an aerospace technology data bank and currently uses NTIS and the Smithsonian Science Information Exchange), conferences and workshops, cooperative projects (the ASVT's, for example), several demonstration projects, a wide range of publications, R&D funding, and a network of field centers. NASA technology transfer reaches into many sectors of the economy through contributions to fields as diverse as computer technology, materials, medicine, remote sensing, and the basic sciences themselves.

With this impressive record, NASA continues to improve the effectiveness of its technology transfer programs. Based on the survey results, certain mechanisms are employed by Federal agencies in technology transfer activities which could potentially be employed by OSTA in the conduct of its programs. These mechanisms have not been widely utilized by NASA in the past and include the use of Federal agencies to reach counterpart state agencies, brokers and transfer agents, people transfer, and equity capital.

Use of Federal Agencies to Reach Counterpart State Agencies. Many of the technology transfer activities studied involved the transfer of technology from a Federal agency to counterpart state agencies. Several agencies have formed close cooperative arrangements with their state counterparts because of common operating objectives. Justice (law enforcement) is a good example of this mode of operation. EPA, HUD, Interior, HEW and Transportation also have close state/Federal operating relationships. In each case, the Federal agency is conducting programs which are operationally similar to the

state programs. Programs such as the Coastal Zone Management Office (Interior) do not conduct operational activities similar to those performed by state planning agencies, but they nonetheless provide a focus to state planning through funding and review mechanisms.

NASA, obviously, cannot directly utilize counterpart state agencies since it has none. The Agency could, however, take advantage of the several existing Federal/state relationships by using the Federal agencies as a channel to counterpart state agencies. NASA has taken advantage of this mechanism to a limited extent in such cases as its work on protective fire clothing with the National Fire Prevention and Control Administration.

Brokers and Transfer Agents. Battelle recently completed a study for the National Science Foundation[6] to review and analyze Federal efforts to transfer technology to state and local governments. Many of the programs studied employed technology agents, particularly those programs targeted toward solving general problems of a local community such as technological inputs to planning. The successful agents were primarily links to identify both current problems and potential sources of technology for immediate solutions. Agents who acted as sources of technology (e.g., they promoted a specific technology) rather than as links were generally less successful in the local community environment. The criticality of this appears to reside in the fact that the successful agent must emphasize sensitivity to the problems of the people who need assistance rather than a particular technical expertise which may be needed. The further implication for NASA is that transfer of technology such as a specific application of remote sensing to the state and local environment may be more efficient through an agent already involved in the local community as a generalist in technology transfer. This agent would serve primarily as a link between local requirements and technical expertise. The use of an agent who is primarily technology-focused (e.g., an expert in remote sensing) may be considerably less effective, since the technically trained agent would be a source rather than a link.

The application of a specific technology can be disseminated to officials interested in the area, and the generalist agent can be a useful dissemination tool because of his understanding of local requirements. This dissemination is enhanced by demonstration projects to illustrate feasibility, exemplary projects which demonstrate successful application to similar users, and follow-up with training sessions, direct assistance, and clearinghouses.

Many of the programs studied in this survey used universities as agents in the operation of various information centers (such as NASA's university centers). In most cases, the information centers were passive, i.e., dependent on the user to walk in for assistance. An exception to this is the Small Business Administration's program of actively encouraging local business to use its resources with a network of regional generalist agents.

People Transfer. While people transfer is not widely used as a primary mechanism in Federal technology transfer activities, it remains a highly effective technology transfer mechanism. Many of the technology transfer programs studies used this mechanism informally. The most successful application of this mechanism observed in the current study was the Research Associates Program at the National Bureau of Standards. This program can be judged successful by the industrial support it has engendered since 1921. Though NASA does participate in summer programs, and programs such as the Presidential Exchange Program, there are no exchange programs geared to specific technologies such as remote sensing. Conceptually, a program could either have NASA experts resident in state agencies, or have state personnel assigned to specific NASA programs, in remote sensing, for example. Other combinations such as personnel "swaps" are possible, and support could range from total Federal funding to partial state support. In Battelle's opinion, this mechanism would be particularly effective in engendering two-way understanding of both user needs and requirements, and technology capabilities.

Equity Capital. A recent study of private sector innovation sponsored by the National Science Foundation[7] showed that lack of capital was one of the top four obstacles to innovation (in 40 percent of cases studied). Other obstacles included lack of market (28 percent), poor management (24 percent) and laws and regulations (18 percent). The study involved a survey of both large and small firms. Lack of capital was a much higher cause of innovation failure in small firms than large firms. Small new ventures were particularly vulnerable to capital problems. Another study[8] points out that in many instances commercially marginal projects are turned down by venture capitalists because of the considerable risk involved. Capitalists might be attracted to the venture if some means of underwriting risk were available. The authors note that a federally administered risk

insurance scheme could potentially stimulate high technology ventures. Yet another study[9] attests to the importance of the small, innovative firm to the technology transfer process. It is pointed out, however, that no conclusive research has been conducted on whether the small firm established solely for the purpose of bringing a new product to market actually outperforms the large and medium-size established companies in innovation. What is clear from the literature is that small firms have contributed heavily to diffusion of new technology, and that these firms have difficulty obtaining necessary capital. It would appear that NASA could initiate a program of selected venture financing or risk underwriting to stimulate technology diffusion in areas such as specific applications of remote sensing.

Agricultural Extension Service

Though the technology transferred through the Agricultural Extension Service is usually not aerospace technology of interest to OSTA, the extensive field service network has been often held as a model of technology transfer efficiency. Because of this, the technology transfer activities of the Department of Agriculture are discussed for background information which may be useful to OSTA consideration of Federal technology transfer activities.

The Morrill Act of 1862 both established the U.S. Department of Agriculture and authorized the establishment of universities to disseminate agricultural and mechanical knowledge. This act gave grants of land to the states under the condition that the proceeds from the sale of the land were to be used to establish and subsidize universities which were required to teach agricultural subjects. Subsequent legislation established agricultural experiment stations to conduct research, and the Cooperative Extension Service to transfer knowledge developed by the experiment stations. The Morrill Act, then, is one of the early technology transfer directives of the Federal Government, and has been part of developing the U.S. agricultural sector into the most efficient in the world as indicated by many measures of productivity.

In addition to many other USDA programs directly supporting or regulating agriculture, agricultural products and services is a substantial research, development, and education effort. This effort is carried out by several branches:

Agricultural Research Service

Cooperative State Research Service

Economic Research Service

Statistical Reporting Service

Soil Conservation Service

Farmer Cooperative Service

Forest Service

Cooperative Extension Service

Current Research Information Service.

Funding and manpower for research and education are given in Table 4. No major distinction is made between educational activities involving training in current techniques and those involving new techniques.

- The Agricultural Research Service (ARS) and Cooperative State Research Service (CSRS) are the principal performers of R&D for the USDA. The cooperative laboratories are typically 50 percent funded by state governments with the remainder coming from industry, foundations and the Federal Government. Research results over the years have led to both new agricultural products and new uses for existing products as well as a large number of improved varieties from the plant and animal breeding programs.
- Agricultural economics research is conducted by a separate Economic Research Service while market data, useful by itself and for economic research, is collected and disseminated by the Statistical Reporting Service. In addition to current market data, crop volume estimates and storage reports are prepared and disseminated; these have a great influence on commodities markets.
- The Forest Service, which manages 187 million acres of timber and grasslands, also conducts research in tree breeding, forest fire detection, fighting and prevention as well as forest management. State and private forest owners and timber product manufacturers are encouraged to participate in Forest Service programs and use the results of their R&D.
- The Soil Conservation Service and Farmer Cooperative Service are relatively small, from the standpoint of Federal funding. Their job is to assist local districts and groups to establish their own programs with advice, assistance and experience from past activities in these areas as well as new research results.
- The Cooperative Extension Service is the primary educational arm of the USDA. Through its educational activities in 3150 counties in all 50 states and in many urban areas of those states, the CES transfers the knowledge of past experience and current research to individuals through classroom and outreach programs. The USDA via the CES has the largest technology transfer organization in the U.S. Government.

- The Current Research Information System provides both technical and managerial information about recent past (1969), current and planned R&D by the ARS (Federal) and CSRS (state) and other cooperating institutions.

A summary of the USDA level of effort in technology and technology transfer and education is given in Table 5.

Program Evaluations

Almost all of the programs studied use combinations of several mechanisms in the conduct of technology transfer activities. It is difficult to determine the effectiveness of any particular mechanism taken by itself, since synergistic effects may develop between mechanisms used in a given technology transfer activity. In programs where one mechanism is used predominately, the effectiveness of the mechanism could be evaluated on the basis of program success. Unfortunately, measures of success are not built into most Federal technology transfer activities. Various measures of program effectiveness have been attempted by program administrators ranging from user surveys, to requests for information, to numbers of licenses of a particular innovation. NSF[2], points out that program effectiveness should be measured on two criteria:

(1) Measures of utilization of program output by users
(2) Impact that the use of program output has on the attainment, by users, of their goals.

Most of the existing evaluation effort is addressed toward Item 1, measures of use of program output. Almost no effort is directed toward Item 2 in most programs.

Battelle recently completed a review and anlaysis of Federal technology transfer efforts to state and local governments for the National Science Foundation[6], in which it was noted that technology transfer programs typically used multiple mechanisms, as also noted in this survey. The complexity of multiple mechanisms creates difficulty in determining a single mechanism characteristic which varies from program to program and which correlates with success or failure of the technology transfer effort. It was also observed that mechanisms took varied characteristics in different programs. Similarly, the definition of program success with respect to technology transfer was in some cases unclear, since technology transfer was

TABLE 5. U.S. DEPARTMENT OF AGRICULTURE RESEARCH AND EDUCATION ACTIVITIES

	Millions of Dollars		Man-Years of Effor	
	FY 1977	FY 1978	FY 1977	FY 197
Agricultural Research Service	$ 283	$ 325	9,643	9,69
ARS Special Foreign Currency Account	7	6	-	-
Cooperative State Research Service			295	31
Agricultural Stations	95	106		
Forestry Research	8	10		
Colleges	13	14		
Research Grants	6	7		
Cooperative Research Grants	-	14		
Rural Development Research	2	2		
Federal Administration (Includes Current Research Inf. Syst. and Soil Conservation Service)	4	5		
Economic Research Service (Includes Farmer's Cooperative Service and Statistical Reporting Service)	31	35	3,184	3,233
Forest Service	90	106	Not Separated	
Cooperative Extension Service (Education)	242	269	Not Separated	
Total Research and Education	782	899	27,538	27,602
Total USDA (Budget Auth.)	$15,467	$17,209	113,000	117,000

sometimes a second-order program objective. None of the programs had been designed to evaluate mechanisms per se, though most of the programs did use some measure of utilization of program output.

Certain mechanisms do tend to cluster around specific objectives and groups of target users. The Battelle study, for example, showed that programs directed at technologists working on specific problems used clearinghouses and data centers, that programs directed at state and local governments tended to utilize demonstration projects, training programs, workshops, and similar techniques, and that programs addressing urban problems tended to use technology agents with backup sites such as field offices or university centers. Whether these mechanisms are optimum or simply self-perpetuating remains largely undetermined.

Review of Federal Technology Transfer Projects

In addition to a review of ongoing Federal programs in technology transfer, a review of current or recently completed Federal research and demonstration projects in technology transfer to state and local governments was made to provide perspective on specific Federal research and experimentation in the field of technology transfer. The source document for this review was a survey of Federal projects in technology transfer to state and local governments performed for Battelle by the Smithsonian Science Information Exchange[5].

The original survey contained 286 abstracts of ongoing or recently completed research projects covering the period from late 1974 through late 1976. The number of abstracts was reduced to 95 by consideration of areas of technology of interest to OSTA, as discussed earlier. Projects in economics, social science, rehabilitation, and other areas of little interest to OSTA were eliminated, while research abstracts on general studies in technology transfer were included for NASA's reference. The final reports on these research activities are considered to be useful as current background information on technology transfer and innovation theory.

The selected abstracts are listed in Appendix C; information provided includes the name of the sponsoring agency/office and a brief description of the area of investigation. The Smithsonian Science Information Exchange index number is included for further reference.

The technology transfer projects selected for review by OSTA fall into five major categories:

(1) General background, mechanisms, and theory of innovation and technology transfer
(2) General technology transfer activities to state governments
(3) General technology transfer activities to local governments
(4) Transfer of specific technologies
(5) NASA projects.

The largest sponsor of research in the field of technology transfer was the National Science Foundation.

Funding by agency and administration is shown in Table 6 for the 95 projects selected. Funding by subject category is shown in Table 7. Since projects are carried on the Smithsonian Science Information Exchange computer system for a period of up to 2 years after completion, the tabulated funding levels reflect a level of expenditure of at least two times the annual funding level for these activities. In some cases, funding for projects was unspecified, so amounts may be understated. The data in Tables 6 and 7 nonetheless provide a perspective of the extent of Federal research and experimentation in technology transfer and related activities.

TABLE 6. 1974-1976 FUNDING BY AGENCY/ADMINISTRATION FOR SELECTED RESEARCH PROJECTS IN TECHNOLOGY TRANSFER OF INTEREST TO OSTA

Agency/Administration		Funding[a] ($000)
Commerce/National Bureau of Standards		465
Department of Energy		Unspecified
Environmental Protection Agency		Unspecified
Health, Education and Welfare		72
Housing and Urban Development		1,135
Justice		565
National Science Foundation		6,172
Advanced energy resources research	93.4	
Advanced products research and technology	692.1	
Exploratory research and problem assessment	108.0	
Experimental R&D incentives	1862.0	
Integrated science & public technology	658.8	
Intergovernment science & research	1295.3	
National and international programs	100.0	
National R&D assessment	513.3	
Planning and resources management	323.9	
Public technology projects	131.2	
Science information	435.5	
NASA		1,324
Transportation		248
U.S. Postal Service		30
TOTAL		10,011

(a) Current dollars. Amounts may be understated since funds are not reported for some projects.

TABLE 7. 1974-1976 FUNDING BY GENERAL SUBJECT CATEGORY OF SELECTED FEDERAL RESEARCH PROJECTS IN TECHNOLOGY TRANSFER OF INTEREST TO OSTA

Subject	Funding Level[a] ($000)
General background, mechanisms, and theory of innovation and technology transfer	1,117
General technology transfer activities to state governments	1,327
General technology transfer activities to local governments	2,727
Transfer of specific technologies	3,516
NASA projects in technology transfer	1,324
Total Federal funds for research on technology transfer in areas of interest to OSTA	10,011

(a) Current dollars. Amounts may be understated, since funds are not reported for some projects.

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APPENDIX A

TASK ORDER AGREEMENT

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APPENDIX A

TASK ORDER AGREEMENT

Recent reorganization of the Office of Space and Terrestrial Applications (OSTA) has resulted in considerable attention being given to the approach to and mechanisms through which NASA accomplishes technology transfer to the public and private sector. Acknowledgement of the strong links between technology transfer and national productivity has spawned a number of approaches to technology transfer in the federal, state/local and private sectors offering: (1) an experien e base from which NASA can benefit; and (2) a variety of possible outlets for augmenting NASA's own technology transfer systems.

To provide the Office of Space and Terrestrial Applications with appropriate information in a timely manner, it is requested that the contractor perform the following tasks:

1. Identify on-going technology transfer programs in other federal agencies summarizing:

   - How long has the effort been going on
   - The nature of the technology transferred (e.g., hardware, techniques, information).
   - Areas of emphasis (e.g., medicine, agriculture, energy, remote sensing...).
   - Resources devoted to technology transfer over the last 3 years ($ and manpower).
   - What mechanisms are used for disseminating the technology, organizational arrangements
   - How are universities and industry utilized?

Primary emphasis should be placed on:

(a) "Aerospace" technologies comparable to those of interest to OSTA;

(b) Transfer to state and local government entities.

2. Identify existing technology transfer programs/mechanisms outside NASA that could be used as outlets for dissemination of NASA technology. What are the requirements for utilizing these outlets on the part of the end user, the disseminating agency and NASA.

Effort on this task is to be completed by January 15 with delivery of a final report by January 30.

APPENDIX B

DETAILED INFORMATION ON SELECTED GOVERNMENT AGENCY PROGRAMS IN TECHNOLOGY TRANSFER IN AREAS OF INTEREST TO OSTA

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TABLE B-1. FEDERAL TECHNOLOGY TRANSFER ACTIVITIES OF INTEREST TO OSTA, PROGRAM DETAIL

Page	Agency	Bureau/Administration	Program	Technology Transfer Effort
B-5	Commerce	Economic Development Administration	University Center Program	$3,000,000(1)
B-6	Commerce	Ditto	Connecticut Product Development Corporation	100,000(1)
B-7	Commerce	"	Massachusetts Science and Technology Foundation	50,000(1)
B-8	Commerce	"	NEUS, Incorporated	100,000(1)
B-9	Commerce	"	Los Angeles Chamber of Commerce	150,000(1)
B-10	Commerce	National Bureau of Standards	Experimental Technology Incentives Program	3,200,000
B-11	Commerce	Ditto	Research Associates Programs	3,000,000(2)
B-12	Commerce	"	Standard Reference Data Program	3,000,000
B-13	Commerce	"	Standard Reference Materials Program	3,500,000(3)
B-14	Commerce	"	Office of Weights and Measures	750,000
B-16	Commerce	National Fire Prevention and Control Administration	Fire Safety and Research Office	2,750,000(4)
B-18	Commerce	National Oceanic and Atmospheric Administration	Coastal Zone Management Office	18,000,000(5)
B-20	Commerce	Ditto	Environmental Data Service	2,800,000(6)
B-22	Commerce	"	Marine Ecosystems New York Bight	3,000,000(7)
B-24	Commerce	"	National Marine Fisheries Service	8,000,000(8)

TABLE B-1. (Continued)

Page	Agency	Bureau/Administration	Program	Technology Transfer Effort
B-26	Commerce	National Oceanic and Atmospheric Administration	Office of Marine Technology	$3,000,000[9]
B-27	Commerce	Ditto	Geodetic Survey (New Initiative)	3,000,000
B-28	Commerce	"	National Ocean Survey, Distribution Branch	8,000,000
B-29	Commerce	"	Office of Ocean Engineering	undetermined
B-31	Commerce	"	Office of Sea Grant	30,000,000[1,10]
B-32	Commerce	National Technical Information Service	Inquiry Service and TT Programs	16,000,000
B-34	Commerce	Patent and Trademark Office	Patent Information and Special Reports	35,000,000[11]
B-35	Commerce	U.S. Maritime Administration	MarAd Research and Development Program	20,000,000[10]
B-36	DoD	DoD Laboratories	Federal Technology Transfer Consortium	25,000,000[12]
B-37	Energy	Office of Conservation	Division of Industry	staff of 30, budget undetermined[13]
B-38	Energy	Environment and Safety	Office of Planning	undetermined[13]
B-39	Energy	Fossil Energy	Various Programs	undetermined[13]
B-41	Energy	Technical Information Services	Technical Information Center	staff of 225 and contract support, budget undetermined[13]
B-42	Energy	Solar, Geothermal and Advanced Systems	Technology Transfer Branch	2,500,000
B-44	Environmental Protection Agency	Technology Transfer Office	Environmental Research Information Center	3,000,000

TABLE B-1. (Continued)

Page	Agency	Bureau/Administration	Program	Technology Transfer Effort
B-45	Health, Education, Welfare	National Institutes of Health	Medical Applications Research	$1,000,000
B-47	Health, Education, Welfare	Public Health Service	Health Services Administration	undetermined
B-49	Housing and Urban Development	Policy Development and Research	Product Dissemination and Transfer	600,000
		Director's Office	Technical Assistance to State and Local Governments	10,000,000
B-52	Interior	Library and Information Services	Natural Resources Information System	500,000
B-54	Interior	U.S. Fish and Wildlife Service	Biological Service Office Information Transfer Project	800,000
B-57	Interior	U.S. Geological Survey	Land Information Analysis Office	17,000,000
B-60	Interior	Bureau of Mines	Mining Research Technology Transfer Group	250,000 3 staff +
B-63	Interior	Water Research and Technology	Technology Transfer Program	2,200,000
B-65	Justice	Law Enforcement Administration	Technology Transfer Division	10,000,000 staff of 25
B-68	National Science Foundation	Research Applications Directorate	Research Applied to National Needs	6,500,000(14)
B-71	Small Business Administration	Office of Technical Assistance	Technology Assistance Program	1,000,000
B-73	Transportation	Various Administrations		undetermined
B-77	Smithsonian Institute	Smithsonian Science Information Exchange	Research Abstracts Service	13,000,000

Footnotes are on Page B-4.

TABLE B-1. FOOTNOTES

(1) Partial or matched funds. Fund recipient usually contributes a like amount, so actual TT effort is double the amount indicated.

(2) Level of effort is considerably greater than program budget. Seventy-six associates are supported by sponsoring companies. Additional resources available from NBS operating divisions in manpower and program activities.

(3) Additional resources include about 60 man-years from other technical divisions of NBS.

(4) Includes $2 million technology transfer funds and $750K public information funds.

(5) Includes funds solely for support of state planning program design. Additional funds are administered to support approved programs.

(6) Includes ESIC funds only. Other TT activities occur in EDS budget of $20 million.

(7) Supported additionally by EPA and state and local agencies, and by manpower and resources from other NOAA divisions.

(8) Includes resource utilization group only. Two million dollars is reimbursable from industry.

(9) Technology developed primarily for NOS requirements. TT is an undetermined portion of this amount.

(10) Includes R&D performance and TT. TT is often designed into research programs.

(11) Patent circulation considered as TT. Forty-five million dollars of $83 million office budget is for searches relative to issuing new patents, not included as TT.

(12) Primarily interagency transfers. About 2 percent of Federal laboratory budget is used for technology transfer.

(13) Recent DOE organization has confused accounting for activities such as TT. It is usually conducted at program level, or as integral part of overall R&D project.

(14) ISPT program budget (with RANN) $3.6 million for intergovernmental TT, $1 million for industrial programs. Estimate for total RANN TT is about 10 percent of RANN budget of $65,000,000. TT is integral part of RANN R&D projects.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: Economic Development Administration
3. OFFICE/PROGRAM: Office of Technical Assistance/University Center Program
4. TECHNOLOGY FIELDS: Federal Technology - all fields
5. PRODUCTS TRANSFERRED: Information linked with NTIS and 60 Federal Laboratories
6. APPLICABILITY TO OSTA: NASA research abstracts are available through computer data banks. University Centers are used as a principal mechanism and are applicable to OSTA programs.
7. MECHANISMS: One-to-one counseling with firms. Program is primarily directed toward technical assistance to small business. Universities are used as walk-in assistance centers. Technical problem is discussed, and an effort is made to find an answer within the Federal research structure. NASA centers, as well as 60 Federal Laboratories, are linked to this system. NTIS is utilized. Currently using 20 university centers, the program was initiated in 1963, and has been at its present level since 1970. Plans are to expand to 35 centers later this year. Budget is about $3 million per year. Four or five persons in each university are supported by partially matched funds.
8. UNIVERSITIES: Funded as transfer centers.
9. INDUSTRY: Counseling to industry on high technology issues.
10. PRINCIPAL USERS: Industry, especially small business.
11. DURATION: Started in 1963. At present level for 8 years.
12. SCOPE: $3 million annually in matching funds.
13. CONTACT: Mr. I. M. Baill, Director, EDA Office of Technical Assistance (202) 377-5111.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: Economic Development Administration
3. OFFICE/PROGRAM: Office of Technical Assistance/Support of Connecticut Product Development Corporation
4. TECHNOLOGY FIELDS: High technology product development
5. PRODUCTS TRANSFERRED: Venture products - hardware
6. APPLICABILITY TO OSTA: Program objective is commercialization of high technology products which potentially could come from NASA programs. Venture capital is a unique mechanism which NASA could utilize.
7. MECHANISMS: Equity capital for R&D. Identification of potential innovative high technology products and funding of development with selected companies.
8. UNIVERSITIES: Not used
9. INDUSTRY: High technology ventures with industry
10. PRINCIPAL USERS: Industry, especially small business
11. DURATION: Since 1975
12. SCOPE: The Connecticut Product Development Corporation was initially supported at a level of $100,000 per year in partial funds from EDA. The State of Connecticut additionally supported two or three persons as feasibility experts to determine which development requests should be funded on the basis of technical feasibility and market analysis. The company will soon become self-supporting on a state bond issue which will provide $10 million in low interest capital. Some funds have also been provided under an arrangement with the Bureau of Standards. Fifteen product developments have been supported to date, and self-sufficiency through royalty payments is expected by 1979.
13. CONTACT: Mr. I. M. Baill, Director, EDA Office of Technical Assistance (202) 377-5111.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: Economic Development Administration
3. OFFICE/PROGRAM: Office of Technical Assistance/Support of Massachusetts Science and Technology Foundation
4. TECHNOLOGY FIELDS. General, Federal and private
5. PRODUCTS TRANSFERRED: Patents, innovations, information
6. APPLICABILITY TO OSTA: Patents and innovations from Federal Sector include NASA developments. Partial state funding and the use of a university center are applicable to OSTA.
7. MECHANISMS: Uses state's existing technical, financial, and business resources to exploit technology, help small firms, and form new firms. An extensive technology data bank (Massachusetts technology exchange program) has been developed which includes patents and innovations from Federal and private sources.
8. UNIVERSITIES: University Center, linked to S&T Foundation Office
9. INDUSTRY: Technical, marketing and financial assistance
10. PRINCIPAL USERS: Small firms
11. DURATION: 2 years
12. SCOPE: EDA supports this effort with about $50,000 annually in grants matched by state funds. The Foundation staff is two to three persons.
13. CONTACT: Mr. I. M. Baill, Director, EDA Office of Technical Assistance (202) 377-5111.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: Economic Development Administration
3. OFFICE/PROGRAM: Office of Technical Assistance/Support of NEUS, Inc.
4. TECHNOLOGY FIELDS: Aerospace technology in general
5. PRODUCTS TRANSFERRED: Information, scientists, engineers
6. APPLICABILITY TO OSTA: The use of people transfer in technology transfer is a mechanism which has been shown effective in high technology areas and which could be employed by OSTA.
7. MECHANISMS: NEUS is an association of unemployed space scientists forming a high technology service organization which acts as a consultant group to industry. The objective of the association is to develop jobs for scientists and engineers who have been phased out of existing programs in the aerospace industry.
8. UNIVERSITIES: Not used
9. INDUSTRY: Source of unemployed scientists, engineers
10. PRINCIPAL USERS: Small firms in need of high technology consulting and personnel
11. DURATION: Since 1970
12. SCOPE: $100,000 per year matching funds. Organization is becoming self-sufficient.
13. CONTACT: Mr. I. M. Baill, Director, EDA Office of Technical Assistance (202) 377-5111.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: Economic Development Administration
3. OFFICE/PROGRAM: Office of Technical Assistance/Los Angeles Chamber of Commerce Program
4. TECHNOLOGY FIELDS: High technology in general
5. PRODUCTS TRANSFERRED: Information
6. APPLICABILITY TO OSTA: The use of a local organization as an agent and information center to reach local users is of interest to OSTA. Note the use of Chamber of Commerce as a conduit to local industry.
7. MECHANISMS: Information packages assembled by Technology Information Source Center
8. UNIVERSITIES: Not used
9. INDUSTRY: Organized around Chamber of Commerce to provide local industry access to high technology data banks
10. PRINCIPAL USERS: Local industry
11. DURATION: Third year
12. SCOPE: $150,000 per year (matching funds). Organization to become supported by local industry.
13. CONTACT: Mr. I. M. Baill, Director, EDA Office of Technical Assistance (202) 377-5111.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: National Bureau of Standards
3. OFFICE/PROGRAM: Experimental Technology Incentives Program (ETIP)
4. TECHNOLOGY FIELDS: Federal technology, general
5. PRODUCTS TRANSFERRED: Studies and policy experiments in Federal technology transfer
6. APPLICABILITY TO OSTA: Trial programs of private sector and government interaction may be of interest to NASA.
7. MECHANISMS: Cooperative efforts with Federal agencies. Regulatory reform, procurement practice (technology advanced goods), economic assistance (government regulation of capital), small business participation in high technology.
8. UNIVERSITIES: NA
9. INDUSTRY: Studies of private sector and government interaction - trial programs (FDA and PMA, as an example). Interaction with state regulatory commissions.
10. PRINCIPAL USERS: Government decision makers at Federal and State levels
11. DURATION: Established in 1972
12. SCOPE: $3.2 million/year (including $700K manpower, $2.5 million project funds)
13. CONTACT: Mr. Dick Penn, Acting Chief (301) 921-3185.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: National bureau of Standards
3. OFFICE/PROGRAM: Research Associate Programs
4. TECHNOLOGY FIELDS: Measurement, materials properties, computer science
5. PRODUCTS TRANSFERRED: Information, techniques, materials, hardware
6. APPLICABILITY TO OSTA: The program is a classic example of use of people transfer in technology transfer.
7. MECHANISMS: Industrial associates work at NBS on defined problems of mutual interest.
8. UNIVERSITIES: Not applicable
9. INDUSTRY: Industrial research associates are supplied by the private sector. The sponsoring company pays the salary of the research associate, while NBS pays for the research costs and supporting activities.
10. PRINCIPAL USERS: Industry and trade associations
11. DURATION: Since 1921
12. SCOPE: 76 associates are funded by their companies in 24 programs. One person and supporting staff (secretary) run program, $3 million annual program budget.
13. CONTACT: Mr. Peter R. deBruyn, Industrial Liaison Officer (301) 921-3591.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: National Bureau of Standards
3. OFFICE/PROGRAM: NBS Standard Reference Data Program
4. TECHNOLOGY FIELDS: Engineering and physical science properties
5. PRODUCTS TRANSFERRED: Information on physical and chemical properties of materials from worldwide research literature and publications is verified and evaluated through programs at research centers.
6. APPLICABILITY TO OSTA: The program uses data centers for specific fields. Some universities are used as data centers.
7. MECHANISMS: Provides source materials on physical and chemical properties for research programs and engineering design applications. Twenty data centers have been established to evaluate data in specialized fields.
8. UNIVERSITIES: Some used as data centers. Projects on contract to universities.
9. INDUSTRY: Projects on contract with industry
10. PRINCIPAL USERS: Researchers and engineers in industry, government and academic sectors
11. DURATION: Undetermined
12. SCOPE: $3 million budget, which includes support of 12 Headquarters staff
13. CONTACT: Dr. David Lide (301) 921-2467.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: National Bureau of Standards
3. OFFICE/PROGRAM: Standard Reference Materials Program
4. TECHNOLOGY FIELDS: Standard Reference Materials
5. PRODUCTS TRANSFERRED: Over 1,000 standard reference materials (SRM); quality control procedures; physical properties standards; water, particulate, and gaseous pollutant calibrations; clinical analyzer calibrations; basic materials properties.
6. APPLICABILITY TO OSTA: NASA programs may become involved in new materials development and analysis technology. The mechanism is of interest to OSTA because the operation is government run, but self-supporting on sales revenues.
7. MECHANISMS: Sales of 32,000 SRM units per year (25 percent in foreign sector).

   The SRM operation including production, distribution, and business operations is self-supporting on sales revenues. The production is a $1.4 million activity and the business operation is a $1 million activity.
8. UNIVERSITIES: Not used
9. INDUSTRY: Iron and steel, glass, ceramics, plastics, others
10. PRINCIPAL USERS: Health, environmental, research, commerce, manufacturing in industry and government
11. DURATION: Since 1910
12. SCOPE: $2.4 million reimbursable sales. Congress has provided $1 million per year to develop new SRMs, which is not recoverable by sales. The operation budget includes about 30 people. An additional source of funds for the SRM operation is about 60 man-years from the Bureau of Standards' other technical divisions.
13. CONTACT: Mr. Paal Cali, Chief, SRM (301) 921-3479.

1. AGENCY: Commerce

2. BUREAU/ADMINISTRATION: National Bureau of Standards

3. OFFICE/PROGRAM: Office of Weights and Measures

4. TECHNOLOGY FIELDS: Measurement standards and devices

5. PRODUCTS TRANSFERRED: Techniques, standards, new measurement technology

6. APPLICABILITY TO OSTA: The use of conferences to resolve interrelated issues involving diverse user groups is a mechanism of interest to OSTA. Regional workshops and state training schools may be applicable to a technology such as remote sensing.

7. MECHANISMS: Annual conference, regional conference, state training schools, standards and calibration laboratory design.

Activities of the Office of Weights and Measures within the National Bureau of Standards are directed at uniformity in trade standards and advancement of weights and measures technology. Activities involve state and local regulatory agencies, equipment manufacturers, trade associations, and related groups and include:

National Conference on Weights and Measures
Regional conferences (workshops)
State training schools
Standards laboratory design
Standards and calibration work and other programs.

The Annual National Conference of Weights and Measures provides a forum for State and Federal regulatory, equipment manufacturers, trade associations (such as the grocers' association which developed the Uniform Product Code), and related interests to exchange problems and issues in the marketplace and advance new technology. The development of electronic scales was made possible by resolving many interrelated issues through the conference. Various subcommittees have been formed which report to the secretary twice each year. These include such subcommittees as systems design, rules and regulations, inspection technology, and the like. The conference is well regarded by industry, trade, and regulatory interests. The conference has been held annually since 1905.

Regional conferences are in effect workshops for state and local regulatory officials and laboratory personnel. The National conference helps to focus the content of these workshops. The regional conferences are held annually in each region and have been in effect since 1913 (NE), 1917 (SE), 1955 (W), and 1972 (NE). A significant feature of the regional program is that the research personnel participate in the workshop to identify state needs and focus potential problems into further research at NBS.

In addition to the regional conferences, state-held meetings are conducted in about 30 states each year as training schools. A 2- to 3-day training session for state and local inspectors and state weights and measures laboratory personnel is conducted by a 1- or 2-man team from the Office of Weights and Measures. As a conservation move, this activity is likely to become regionalized.

The office assists state weight and measures departments in design of standards laboratories and workshops on standards maintenance at the laboratory level.

Standards and calibrations programs are conducted which originate from and support national conference activities, and state requirements. Other programs such as a metrification pilot training program are conducted as well.

8. UNIVERSITIES: NA

9. INDUSTRY: Equipment manufacturers and trade groups participate in conference and committees

10. PRINCIPAL USERS: State and local regulatory officials, trade associations, equipment manufacturers, and related industry

11. DURATION: Active since 1905 (see MECHANISMS for further details)

12. SCOPE: Office budget is about $750,000 which includes staff support of 15 individuals. An undetermined amount of support is available to the office from other NBS laboratories in the conduct of their chartered activities.

13. CONTACT: Mr. Harold Wollin, Acting Chief, Office of Weights and Measures and Executive Secretary of the National Conference (301) 921-2401.

1. AGENCY: Commerce

2. BUREAU/ADMINISTRATION: National Fire Prevention and Control Administration

3. OFFICE/PROGRAM: National Fire Safety and Research Office has transfer as inherent objective

4. TECHNOLOGY FIELDS: Fire management, fire fighting technology

5. PRODUCTS TRANSFERRED: Information, hardware, techniques

6. APPLICABILITY TO OSTA: NASA has been involved in firefighting protective equipment and other firefighting technology. The program uses several mechanisms directed at local government which are of interest to NASA.

7. MECHANISMS: R&D with problem orientation, conferences, workshops, advisory groups, expert assistance, publications.

   The National Fire Safety and Research Office has technology transfer as its sole mission. The office seeks to bridge the gap between research activities and practitioners. The efforts of the office fall into three line areas:

   (1) Product development activities with the private sector in:
      (a) health and safety of fire fighters, especially personal protective equipment
      (b) residential fires, namely smoke detectors and advanced systems.

   Private sector involvement includes evaluation of need, productibility, and costs.

   (2) Planning and management research:

   Systems analysis and aerospace management techniques applied to local government needs. Techniques include planning guides, case histories of techniques applied to various cities, experiences of other cities, annual workshop for planning leaders. Note this program is managed by a political scientist and is well received by state and local government.

   (3) Regulatory impact:

      (a) Document the state of the art in fire protection code application
      (b) Develop exemplary administration and enforcement procedures in code enforcement.

   The $2 million budget for the above activities of the office are divided 20 percent in technology development, 60 percent in planning research, and 20 percent in regulatory impact study. An additional $750,000 is spent on public education.

8. UNIVERSITIES: Experts participate professionally

9. INDUSTRY: Expert participation from private sector

10. PRINCIPAL USERS: Federal, state, and local fire and civil defense services engaged in (1) fire protection management and (2) firefighting

11. DURATION: Since 1975

12. SCOPE: The National Fire Prevention and Control Administration has a budget of $14 million annually, which includes $4.5 million funding to the National Bureau of Standards Fire Research Laboratory. Two million dollars are spent on the technology transfer activities of the National Fire Safety and Research Office (which includes support of staff of 14 people) and an additional $.75 million is spent on public education.

13. CONTACT: Mr. Joseph F. Clark, Associate Administrator for Fire Safety and Research (202) 634-7722.

1. AGENCY: Commerce

2. BUREAU/ADMINISTRATION: National Oceanic and Atmospheric Administration

3. OFFICE/PROGRAM: Coastal Zone Management Office

4. TECHNOLOGY FIELDS: Help states to develop coastal areas in an environmentally sound manner

5. PRODUCTS TRANSFERRED: Information, program planning, and technical guidance

6. APPLICABILITY TO OSTA: Coastal zone management planning may benefit from incorporation of remote sensing technology. Coastal Zone Management Office could be used as a technical information conduit to state programs.

7. MECHANISMS: The Coastal Zone Management Act of 1972 was amended in 1976. The legislation was designed to encourage state governments to develop planning programs for development of coastal zone areas (land and water) in an environmentally sound manner.

   The Office of Coastal Zone Management has responsibility for carrying out the legislation. The program is voluntary for the states and provides:

   (1) 80 percent funding for state to design a planning program; and
   (2) 80 percent funding to state agency to administer the program; and provides
   (3) that the state agency set up to do the planning will have precedence over any federal programs, e.g., federal agency activities must conform to the state program.

   There are 30 eligible states and 4 territories (including Great Lakes states). Thirty are currently designing programs and four have programs approved: Washington, Oregon, California, and Puerto Rico. The state programs are reviewed and recertified annually by the Office of Coastal Zone Management.

   In addition to funding, which is the primary motivator, other activities which are used to facilitate the states in coastal zone planning include:

   (1) Regular meetings of state program managers
   (2) Annual conferences
   (3) A newsletter, printed by a private organization
   (4) Handbooks and planning guides
   (5) Technical guidance in areas of generic interest to the states.

8. UNIVERSITIES: NA

9. INDUSTRY: NA

10. PRINCIPAL USERS: State Government

11. DURATION: Program in effect since 1974. Thirty states in planning stage, three states with plans approved.

12. SCOPE: $18 million is currently provided to the states annually to support state planning activities. There is additional funding to administer approved state programs, which will increase each year as the state programs are certified.

13. CONTACT: Mr. Richard Gardner (202) 634-4241.

1. AGENCY: Commerce

2. BUREAU/ADMINISTRATION: National Oceanic and Atmospheric Administration

3. OFFICE/PROGRAM: Environmental Data Service (EDS)

4. TECHNOLOGY FIELDS: Atmospheric, oceanic, and solid earth environment involved in yield predictions for LACIE based on crop-environment climate)

5. PRODUCTS TRANSFERRED: Experiment design, data management, environmental data and information

6. APPLICABILITY TO OSTA: Environmental Data Service has been involved in remote sensing technology. The program employs mechanisms such as the Environmental Science Information Center which uses regional university centers.

7. MECHANISMS:

The Environmental Data Service operates three major data collection centers:

- National Climatic Center (Asheville; climate)
- National Ocean Center (Washington; ocean)
- National Geophysical Sciences Data Center (Boulder: geological).

Additionally, the service operates three other centers:

- Center for Experiment Design and Data Analysis
- Center for Climatic and Environmental Assessment
- Environmental Science Information Center (ESIC).

The data centers handle 78,000 requests for information on data per year. This breaks down:

20 percent academic
24 percent federal
25 percent industry
31 percent other.

Data are supplied on a reimbursable cost basis.

The Center for Experimental Design and Data Analysis is involved in analysis of data and modeling economic, environmental, and other ramifications of, for example, deep water ports. They participated in the LACIE experiment by climatological modeling of wheat yields as input to crop yield predictions.

ESIC handles on line systems on research subjects and publications related to environment. About 3,000 requests per month are currently handled. Four Regional Information Centers (seven to expand to nine) located in universities, co-jointly with National Marine Advisory Service Offices (Rhode Island, Oregon, Washington), are currently being equipped with on-line data inquiry:

(1) Environmental Data Index (ENDEX)
(2) Oceanic and Atmospheric Information Centers (OASIS)
(3) Seorgis - Library of Congress legislation file.

Budget of ESIC is $2.8 million per year. Budget of EDS is about $20 million per year.

8. UNIVERSITIES: Universities are used as information centers in the ESIC program.

9. INDUSTRY: NA

10. PRINCIPAL USERS: Federal, state, local agencies, scientific and engineering communities

11. DURATION: Undetermined

12. SCOPE: The Environmental Data Service Budget, including personnel, is $20 million/year. The ESIC program budget, including personnel, is $2.8 million/year.

13. CONTACT: Dr. Thomas S. Austin, Director, EDS (202) 634-7318.

1. AGENCY: Commerce

2. BUREAU/ADMINISTRATION: National Oceanic and Atmospheric Administration

3. OFFICE/PROGRAM: Marine Ecosystems Analysis Office (MESA)/New York Bight Project

4. TECHNOLOGY FIELDS: Marine environmental systems

5. PRODUCTS TRANSFERRED: Information on marine ecosystems, research results

6. APPLICABILITY TO OSTA: NASA has provided the MESA project with remote sensing technology. The mechanisms employed are an excellent model of federal/local/industrial involvement in research and information transfer.

7. MECHANISMS: Project advisory committees, information user panels, research reports, liaison with federal, state, and local regulatory agencies.

   The Marine Ecosystems Analysis Office within NOAA was established to pull together the existing base of expertise within NOAA involved in studying stressed regional marine areas. The New York Bight Project (referring to the 15,000 square mile area from Montauk Point, New York, to Cape May, New Jersey) was the first major regional marine ecosystem project undertaken. The project, operating since 1973 with a current staff of 10 people and an annual budget of $3 million, has two primary objectives:

   (1) Provide a broad understanding of the marine ecosystem and driving forces
   (2) Explore sewage sludge and other contaminant inputs to the system.

   These objectives are directed toward providing inputs to planners and regulatory decision makers on marine ecology matters. The program operates in the following manner:

   (1) Identify major issues and research requirements
   (2) Define research programs using either NOAA resources or contractors supported with project funds
   (3) Oversee conduct of the research
   (4) Synthesize research results and disseminate information.

   The project has almost daily contact with EPA Region 2, close contact with the state departments of environmental protection, and involvement in other state and local programs. A number of cooperative projects with these agencies utilize shared funds, people, and equipment. Industry also cooperates in experiments such as scheduled dumping of a predetermined level of contaminate to determine environmental effects.

   In addition to long-range project work, the MESA Bight Project has been crisis-oriented in providing local assistance in instances of oil spills, fish kills, and so on. This has

caused a good deal of interaction with the general public as well as the local agencies. To provide better inputs to research planning and information utilization, the Bight Project has organized an advisory committee consisting of the following panels:

(1) Citizens groups and industry requirements
(2) Users information panel with government, scientific, academic, and industry representation
(3) Scientific group to evaluate objectives and research progress.

The stated $3 million annual budget of the Bight Project is considerably larger in fact because of federal agency sharing, state and local sharing, research resources from the NOAA operating divisions, and equipment resources such as the use of NOAA ships, which is about $.75 million per year. It might be noted that NASA has provided remote sensing input to the N.Y. Bight Project.

8. UNIVERSITIES: Academic sector involved in information user panel. The MESA project office is located at the University of New York, Biological Department.

9. INDUSTRY: Participates in research programs and information user panel

10. PRINCIPAL USERS: Federal, state, regional, and local regulatory officials, industry, scientific community

11. DURATION: Since 1973

12. SCOPE: $3 million per year, which includes support of a staff of 10 people. Additional resources are available from NOAA, state, and other federal agencies (see MECHANISMS).

13. CONTACT: Commander Larry Swanson, Head, New York Bight Project (516) 751-7002.

1. AGENCY: Commerce

2. BUREAU/ADMINISTRATION: National Oceanic and Atmospheric Administration

3. OFFICE/PROGRAM: National Marine Fisheries Service/Resource Utilization Group

4. TECHNOLOGY FIELDS: Fishing resources, yields, quotas, methods, remote sensing

5. PRODUCTS TRANSFERRED: Information, hardware, techniques, regulations

6. APPLICABILITY TO OSTA: Has worked with NASA on Landsat, SEASAT, and Nimbus satellite tracking of ocean conditions as related to fish and fishing.

7. MECHANISMS: Primary mechanism is fisheries commissions - three major commissions: Gulf states, Atlantic, and Pacific, and also eight regional management commissions. These commissions consist of federal, state, and industry individuals in a common forum.

   Resource Utilization Group

   The Resource Utilization group within the National Marine Fisheries Service primarily concentrates on development of underutilized species by conducting a broad spectrum of activities ranging from market development (export opportunities) to fishing hardware and techniques. The objective of the program is to help the fishing industry help itself through a wide range of incentives and assistance.

   The program involves 5 geographic regions with a total of 126 persons. Though overall goals are national, fish species and industry concerns are regionalized. Each of the 5 regional centers works with consortia of fishermen and processors, sometimes through regional foundations or task groups. Partial funding either in cash or people or facilities is the usual mechanism for research and demonstration projects, so industry input to the programs is high, and the work problem-oriented. About 20 of the 126 persons are regional representatives; the remaining 106 perform R&D in the regional centers which ranges from economic impact studies to techniques to locate and harvest underutilized species of fish. The output of the research program ranges from reports to demonstration projects.

   The current annual budget is about $8 million for the resource utilization program, of which about $2 million annually is reimbursable from industry.

8. UNIVERSITIES: NA

9. INDUSTRY: Work with industry on common problems. Industry representation on commissions.

10. PRINCIPAL USERS: Federal, state, and local regulatory agencies, fishing industry

11. DURATION: Undetermined

12. SCOPE: Four major research centers at $45 million year, of which $21 million is budgeted for resource assessment, and $8 million budgeted for resource utilization, which includes staff support. (See MECHANISMS for further details.)

13. CONTACT: Mr. Winfried Meibohm, Acting Deputy Director (202) 634-7292
Dr. Lamar Dietz, Scientific and Technical Services (202) 634-7469
Mr. Joe Slavin, Resource Utilization (202) 634-7261.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: National Oceanic and Atmospheric Administration
3. OFFICE/PROGRAM: Ocean and Atmospheric Sciences/Office of Marine Technology
4. TECHNOLOGY FIELDS: Sensor systems - development, testing, calibration; environmental data systems
5. PRODUCTS TRANSFERRED: Technical information, techniques, measurement standards (international)
6. APPLICABILITY TO OSTA: NASA technology in sensor systems and remote date collection may be applicable to Office of Marine Technology. The program is a technology conduit to the scientific oceanographic community.
7. MECHANISMS: Supplies technical information to scientific community, performs reimbursable consultation, performs engineering which is oriented toward applying new technology to scientific systems.
8. UNIVERSITIES: NA
9. INDUSTRY: Joint evaluation of equipment and instrumentation developed by industry or in joint development programs
10. PRINCIPAL USERS: Scientific oceanographic community. Technology is initially developed in response to National Ocean Survey scientific requirements for measurement technology.
11. DURATION: Undetermined
12. SCOPE: The budget is $3 million/year for the office, which includes support of 85 to 90 persons.
13. CONTACT: Mr. William C. Nicholson, Office of Marine Technology (301) 443-8347.

1. AGENCY: Commerce

2. BUREAU/ADMINISTRATION: National Oceanic and Atmospheric Administration

3. OFFICE/PROGRAM: Ocean and Atmospheric Services/National Geodetic Survey

4. TECHNOLOGY FIELDS: Geodesy and geodetic control, mapping, charting, maintenance of national geodetic network

5. PRODUCTS TRANSFERRED: Geodetic techniques, instrumentation, satellite technology

6. APPLICABILITY TO OSTA: A new initiative to be undertaken by the Geodetic Survey will be to utilize new techniques to minimize manpower in maintaining the geodetic network, including remote sensing. The Survey is a conduit to state surveying agencies.

7. MECHANISMS:

   (1) Field offices provide assistance to state and local governments in maintaining geodetic network. Demonstration projects. Personnel include 14 mark-maintenance personnel and 17 geodetic advisors.

   (2) Four workshops are held per year in conjunction with American Congress of Surveying and Mapping. About 80 registered land surveyors and state people attend.

   (3) Projects are undertaken in conjunction with American Society of Civil Engineers.

   (4) Techniques manuals for surveyors are written.

   (5) A National Geodetic Information Center has been established.

   (6) New initiative was submitted this year - $3 million. The initiative involves cooperative surveys with states (50-50) to emphasize new techniques in maintaining the geodetic network; satellites, polaris, ground truthing. The emphasis in the new techniques is on less manpower.

8. UNIVERSITIES: NA

9. INDUSTRY: NA

10. PRINCIPAL USERS: State, local, and Federal agencies

11. DURATION: Since before 1860

12. SCOPE: The survey budget, including manpower, is $10 million per year; about 10 percent of which is reimbursable from other federal agencies.

13. CONTACT: Captain Phillips, Acting Director, National Geodetic Survey (301) 443-8681.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: National Oceanic and Atmospheric Association
3. OFFICE/PROGRAM: National Ocean Survey, Distribution Branch
4. TECHNOLOGY FIELDS: Marine mapping, tidal measurement data, aeronautical data, maps and charts
5. PRODUCTS TRANSFERRED: Marine and aeronautical navigational aids
6. APPLICABILITY TO OSTA: Landsat data may be applied to mapping and/or distributed through the Ocean Survey agents.
7. MECHANISMS: Central Distribution Division publishes $3.5 million per year marine and $4.5 million per year aeronautical data. Agents (such as small airports, marinas) are used as disseminators. Direct mail is used as well (e.g., subscriptions).
8. UNIVERSITIES: NA
9. INDUSTRY: NA
10. PRINCIPAL USERS: Small boat owners, private pilots
11. DURATION: Undetermined
12. SCOPE: Product sales total $8 million per year, sold at cost reimbursable level
13. CONTACT: Mr. Walt Chaffis, Associate Director, Aeronautical Chart Office (301) 443-8071.

1. AGENCY: Commerce

2. BUREAU/ADMINISTRATION: National Oceanic and Atmospheric Administration

3. OFFICE/PROGRAM: Office of Ocean Engineering

4. TECHNOLOGY FIELDS: Marine technology, ocean instrumentation, diving technology, manned undersea science ocean lab module

5. PRODUCTS TRANSFERRED: Information, hardware, techniques

6. APPLICABILITY TO OSTA: The Ocean Engineering Office has continually reviewed NASA programs for space technology which could be applied to undersea problems. The office uses several mechanisms which are of interest to OSTA, particularly the involvement of industry in R&D efforts, the use of universities as information centers, and conferences and workshops.

7. MECHANISMS: Data banks, workshops, publication, involvement of industry in R&D.

The Office of Ocean Engineering is currently engaged in the development of a broad-based technology transfer program and has a contractor currently evaluating such a program, but the scope of such a program has not yet been determined. There are primarily three focal points for technology transfer currently in the Office of Ocean Engineering:

(1) Data Buoy Program
(2) Manned Undersea Office
(3) Ocean Engineering and Technology.

The Data Buoy Program is an $8 million per year project employing 30 civil servants, 30 support contractor people, and 15 Coast Guard personnel. There is no transfer program per se, but most of the systems design and all of the hardware developments are done by industry. As such, the program is regarded by the Office of Ocean Engineering as a form of technology development and transfer. This program has been active since the mid-1960s and is managed by Jerry McCall.

The Manned Undersea Office, under the direction of Donald Beaubaumarige, has established a diver fatality library with University of Rhode Island, and has diver health and safety programs. Work on advanced undersea systems is published.

The Ocean Engineering and Technology group, directed by Jack Cawley, is concerned with a range of technology issues and is of interest to the ocean community. Conferences have been held in areas such as sea floor engineering and ocean instrumentation. In addition, a catalog of instrumentation has been assembled.

The Office of Ocean Engineering practices what it terms technology pull; that is, actively searching out what technologies in related areas (such as space) might be applicable to ocean engineering. Some dialogue has occurred between the NASA technology utilization group and the Office of Engineering in this regard.

8. UNIVERSITIES: Used as information centers

9. INDUSTRY: Involved as support contractor

10. PRINCIPAL USERS: Ocean engineering community

11. DURATION: Several separate ongoing programs. Central technology transfer to become a new initiative (see MECHANISMS above).

12. SCOPE: Undetermined

13. CONTACT: Mr. Steve Anastasion, Chief (301) 443-8327
Mr. Donald Deabeaumarige, Director, Manned Undersea Operation (301) 443-8391
Mr. Jack Cawley, Director, Ocean Engineering and Technology (301) 443-8444
Mr. Jerry McCall, Data Buov Program.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: National Oceanic and Atmospheric Administration
3. OFFICE/PROGRAM: Office of Sea Grant
4. TECHNOLOGY FIELDS: Broad technologies related to coastal zone activities
5. PRODUCTS TRANSFERRED: Information, research results
6. APPLICABILITY TO OSTA: Landsat technology may be applicable to coastal zone activities. Most research grants are matched with universities' funds, a mechanism which may be applicable to OSTA programs.
7. MECHANISMS: R&D funding to universities, dissemination of results through publication, seminars, demonstrations, extension services. Major R&D programs are undertaken involving economists, sociologists, political scientists, scientists and engineers.
8. UNIVERSITIES: Matching funds 50-50
9. INDUSTRY: Most work with industry occurs through institutional programs (universities) because disclosure is potentially a problem with industry participation.
10. PRINCIPAL USERS: Scientific community, government, and industry related to marine resources
11. DURATION: Since 1968
12. SCOPE: $30 million annually, almost entirely in matching grants
13. CONTACT: Mr. Hugh McLellan, Acting Director, Grants (301) 655-4019.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: National Technical Information Service
3. OFFICE/PROGRAM: Inquiry service and technology transfer programs
4. TECHNOLOGY FIELDS: General
5. PRODUCTS TRANSFERRED: Information
6. APPLICABILITY TO OSTA: NASA research is included in the NTIS data base. OSTA may be interested in the NTIS patent licensing program, which would be applicable to NASA technology.
7. MECHANISMS: Technical reports abstracts (government agencies research), computer searches, research reports, abstracts by technical category, technical inquiry services, awareness bulletins by technology, engineering design services, computer files directory, patents licensing program, inventior seminars.

   Four technology transfer programs have been implemented by NTIS in addition to the major inquiry services.

   (1) Patent licensing program ($500,000 per year since 1973). Government-owned patents are reviewed to determine those with a high probability of industrial utilization. The screening and selection process is the largest part of the problem. The goal is to get technology licensed. Seminars are held to generate industrial interest in selected patents.

   Seminars were put on in major cities with about 120 industry persons at each seminar. The industry persons paid for the seminar so costs were fully recovered by NTIS. Inventors were at seminars to discuss inventions with interested parties. Information packages with cassette tapes and other material were available on a cost basis. Contractors were used to set up the six or so conferences.

   Seminars were generally successful, but currently telephone and direct mail are used and seem to stimulate as much interest at less cost.

   (2) Engineering design services ($100,000 per year since 1975). Information on engineering design is provided by design consultants on tour. Goal is to advance state of art in engineering design. Example is "stress from wind on North Sea oil platforms".

   (3) Joint EDA-NTIS program with universities to bring technical assistance to small business. University acts as center and helps to define problem initially. NTIS uses its resources to answer the problem, also to put small businessman in touch with knowledgeable individual from federal laboratory consortium. (See University Center program.)

(4) Technical Help to Exporters (The) ($10,000 yearly since 1976). Consultant at NTIS serves as an intermediary between business and export specialist group in U.K. Goal is to provide assistance in meeting importing regulation of foreign countries ranging from who to talk to in that country to specific criteria on codes, technical requirements, and the like.

8. UNIVERSITIES: University Center program [see (3) above].

9. INDUSTRY: Small business assistance [see (3) above]. Patent program [see (1) above].

10. PRINCIPAL USERS: Government, industry, academic

11. DURATION: Since 1946

12. SCOPE: $16 million budget to operate the inquiry service on a cost incurred basis. Other specific technology transfer programs (see MECHANISMS above) are budgeted at about $700,000, including staff support.

13. CONTACT: Mr. George Kudravetz, NTIS (703) 557-4733
Mr. Joe Coin, Assistant Director, Administrations (703) 557-4608.

1. AGENCY: Commerce
2. BUREAU/ADMINISTRATION: Patent and Trademark Office
3. OFFICE/PROGRAM: Patent information and technology assessment
4. TECHNOLOGY FIELDS: General
5. PRODUCTS TRANSFERRED: Patents, information, technology assessment reports, special patent searches
6. APPLICABILITY TO OSTA: Licensing of NASA developed technology could be stimulated through the patent office information dissemination mechanisms. The use of 27 local libraries as information centers may be a mechanism of interest to OSTA.
7. MECHANISMS:
   (1) Official Gazette, published weekly, gives patent summaries of 1450 patents a week: circulation 2,000-3,000, subscription
   (2) Patent copies - cost reimbursable basis
   (3) Specialized reports - patents listed by class and subclass within patent classification scheme - cost reimbursable basis
   (4) Special published technological reports of patent activity in new high technology areas
   (5) Subscription copies of patents; e.g., all patents issued in subclass X cost reimbursable basis
   (6) Patent Depository Libraries - 27 libraries around the country act as patent depositories - all patents are supplied to libraries with various indexing systems. Yearly conference of PDL representatives.
8. UNIVERSITIES: NA
9. INDUSTRY: NA
10. PRINCIPAL USERS: Government, industry, scientific community
11. DURATION: Undetermined
12. SCOPE: Budget is about $.50 million for (3) special patent reports, (4) special technical reports, and development of new access files and techniques. Patent office budget is $83 million/year, of which $45 million is for searches relative to issuing new patents. Budget figures include office staff.
13. CONTACT: Mr. William S. Lawson, Director, Office of Technology Assessment and Forecast (703) 557-3050.

1. AGENCY: Commerce

2. BUREAU/ADMINISTRATION: U.S. Maritime Administration

3. OFFICE/PROGRAM: MarAd Research and Development Program/Assistant Administrator for Commercial Development

4. TECHNOLOGY FIELDS: Shipbuilding, ship operations, harbor facilities and harbor operations

5. PRODUCTS TRANSFERRED: Techniques, information, computer models, engineering technology

6. APPLICABILITY TO OSTA: The use of cost-shared R&D contracts is considered highly effective in both transferring technology to industry, and in providing user focus to R&D programs. This mechanism is applicable to OSTA in areas such as remote sensing.

7. MECHANISMS: R&D cost-shared contracts, funding, reports, seminars, planning conferences, computerized information base (MRIS), shipyard consortium shares developments; vendor developments are restricted to U.S. for 2-3 years.

   Cost sharing of R&D and a consortium of shipyards operating under a subsidy program is considered highly effective in transferring results of R&D to industry. Most efforts are concentrated on near-term, promising development projects.

8. UNIVERSITIES: No grants are made to universities, but they compete for result-oriented contracts; some sole-source work.

9. INDUSTRY: Joint MarAd-industry development programs on cost-shared basis.

10. PRINCIPAL USERS: Maritime industry; especially shipbuilders. Government has strong say in requirements/ decisions via subsidy payments which are essential to industry survival.

11. DURATION: Continuing, but at a level reduced from peak.

12. SCOPE: R&D from FY 1971 to FY 1976 has ranged from $19 million to $25 million; the current level of R&D is $18 million to $20 million which is about 5 percent of the shipbuilding subsidy of ~$200 million per year. Cost sharing of efforts results in a 2/3 government, 1/3 industry division of R&D effort. Some contracts cost share at 50 percent, some are fully funded.

13. CONTACT: Mr. Borg Paraghamian, Assistant for Program Development and Control (202) 377-4113.

1. AGENCY: Defense

2. BUREAU/ADMINISTRATION: DoD Laboratories (41 laboratories)

3. OFFICE/PROGRAM: Department of Defense Federal Technology Transfer Consortium

4. TECHNOLOGY FIELDS: General

5. PRODUCTS TRANSFERRED: Information, techniques

6. APPLICABILITY TO OSTA: Both the type of technology (scientific information and hardware) and the mechanics used for transfer are potentially of interest to OSTA.

7. MECHANISMS: Association of member laboratories, Federal liaison, Defense Documentation Center (DDC), NTIS, technology brokers, regional transfer agents (SBA), publications.

8. UNIVERSITIES: Perform basic research which totals about 3 percent of total Design Development Test and Evaluation budget. Most research results are reported via DDC.

9. INDUSTRY: Most development programs are performed by industry which transfers technology directly. Classification is only a small problem - most documentation ends in NTIS. Most research and development project descriptions are available through Smithsonian Information Exchange.

10. PRINCIPAL USERS: Federal agencies and contractors, state and local governments, industry.

11. DURATION: Technology Transfer Consortium started in 1971.

12. SCOPE: Maximum of 3 percent of Federal laboratory budget may be devoted to TT; typical is 1 to 2 percent; lab may receive authorization to exceed 3 percent level for specific project. Approximately $325K and 400 managers were directly authorized in FY 1976 for TT; interagency transfer payments run about $25 million per year ($26M in FY 1975 and $24M in FY 1974).

13. CONTACT: Mr. James Terrell, Jr., Special Assistant to Deputy Director, Research and Advanced Technology, Office of the Director, Defense Research and Engineering, Pentagon, (202) 697-4789.

Mr. Nicholas Montanarelli, Program Manager, Federal Laboratory Program, NSF, (202) 634-7936.

1. AGENCY: Department of Energy

2. BUREAU/ADMINISTRATION: Office of Conservation

3. OFFICE/PROGRAM: Division of Industry, Buildings and Community Systems, Division of Energy Storage

4. TECHNOLOGY FIELDS: Energy use, conservation, storage

5. PRODUCTS TRANSFERRED: Information, conservation technology, research results

6. APPLICABILITY TO OSTA: The program has contacts with state, local and industrial users which could be used by OSTA.

7. MECHANISMS: Interfaces with industry groups and companies, university programs, existing Federal information transfer programs, workshops, manuals, publications, outreach programs, cooperative extension programs.

8. UNIVERSITIES: No explicit university program, but some involvement.

9. INDUSTRY: Direct participation, seminars, technical assistance, patent licensing, both exclusive and non-exclusive.

10. PRINCIPAL USERS: Federal, state and local governments, industry, academic.

11. DURATION: Undetermined.

12. SCOPE: Thirty people on staff; various members are involved in TT depending on definition. Cost sharing varies with immediacy of application. Entire budget plus cost sharing may be considered as TT. Has sponsored 200 programs; 120 are still active. Budget undetermined.

13. CONTACT: Mr. Jim Reid, Program Manager, Program Development and Analysis, Technology and Information Transfer, Division of Industry, (202) 376-4814.

1. AGENCY: Department of Energy

2. BUREAU/ADMINISTRATION: Environment and Safety

3. OFFICE/PROGRAM: Responsibility of each project manager - Technology Overview Division

4. TECHNOLOGY FIELDS: High technology instrumentation, X-Ray, laser, nuclear equipment in medicine and science

5. PRODUCTS TRANSFERRED: Techniques, hardware

6. APPLICABILITY TO OSTA: The program is of interest to OSTA because of the high technological level of the products transferred, as an example of a program serving primarily the scientific community.

7. MECHANISMS: Publications, seminars, meetings and conferences with user groups.

8. UNIVERSITIES: NA

9. INDUSTRY: Participants in product development.

10. PRINCIPAL USERS: Scientific and medical communities.

11. DURATION: Ongoing project effort; technology transfer is implicit in R&D conduct.

12. SCOPE: No explicit technology transfer project funding.

13. CONTACT: Dr. George J. Rotariu, Physical Scientist, Administration for Environment and Safety, Office of Planning, (301) 353-4174.

1. AGENCY: Department of Energy

2. BUREAU/ADMINISTRATION: Fossil Energy

3. OFFICE/Program:

Program Divisions:

(1) Coal
(2) Power Systems
(3) Magnetohydrodynamics
(4) Oil, Gas, Shale
(5) Extraction (mining)
(6) Program Control (Administration)

4. TECHNOLOGY FIELDS: Fossil Fuel Technology; coal, oil, gas, MHD, and new sources of fuels.

5. PRODUCTS TRANSFERRED: R&D results, technology, information.

6. APPLICABILITY TO OSTA: The program is of interest because of specific mechanisms used, particularly those directed toward industrial involvement.

7. MECHANISMS: Cost-shared R&D projects with industry are extensively used. Other mechanisms include publications, seminars, symposia, demonstration projects, patent licensing. Primary mechanisms are built into each division program. There is no overall technology transfer effort.

8. UNIVERSITIES: No explicit university program, but universities are used in various roles on specific projects.

9. INDUSTRY: Identification of needs through questionnaires, statistics, formal and informal contacts, R&D sponsorship and cost sharing.

10. PRINCIPAL USERS: Industry, Federal, state and local governments.

11. DURATION: Newly reorganized from ERDA

12. SCOPE: Overall budget for technology transfer efforts not available. Technology transfer efforts are part of each division's operating charter, and are integrated into R&D programs.

13. CONTACTS:

Division of Commercial Applications (202) 376-4158

Mr. Ed Myerson, Chief
Mr. Stan Weis, Staff Assistant

Oil, Gas, and Shale Division (202) 376-4634

Mr. J. Wade Watkins, Deputy Director

Coal Conversion (202) 376-9307

Mr. Richard Cory

1. AGENCY: Department of Energy

2. BUREAU/ADMINISTRATION: Office of Technical Information Services

3. OFFICE/PROGRAM: Technical Information Center

4. TECHNOLOGY FIELDS: All DOE technology, other energy R&D

5. PRODUCTS TRANSFERRED: Information

6. APPLICABILITY TO OSTA: The program is an example of an information center formed around a specific technology area, energy research and development. Conferences, workshops, and R&D funding are used to create an active (rather than passive) Information Center.

7. MECHANISMS: Abstracts of work in progress, technical literature, computer data bank and searches, technical conferences, state and local government reporting and needs program.

8. UNIVERSITIES: Some specific projects, e.g., Texas A&M project on German Wartime Coal Liquification.

9. INDUSTRY: Predominantly information transfer.

10. PRINCIPAL USERS: Scientific community, government, industry.

11. DURATION: Indefinite

12. SCOPE: 214 full-time positions, 48 part-time positions, 32 contractor personnel in film lab and library. Office budget not specified.

13. CONTACT: Mr. Robert L. Shannon, Manager, U.S. DOE Technical Information Center, Oak Ridge, Tennessee, (615) 483-8611, Ext. 34352

1. AGENCY: Department of Energy

2. BUREAU/ADMINISTRATION: Solar, Geothermal and Advanced Energy Systems

3. OFFICE/PROGRAM: Technology Transfer Branch, Solar Energy
Industrial Relations Branch, Geothermal Energy

4. TECHNOLOGY FIELDS: Solar energy, geothermal energy

5. PRODUCTS TRANSFERRED: Information, techniques, materials, hardware

6. APPLICABILITY TO OSTA: Both innovative mechanisms and contacts with industry and governments are potentially useful to OSTA. NASA has some involvement in the solar technology area itself.

7. MECHANISMS: Documents, exhibits, demonstrations, information centers, industry programs.

Solar Energy

Primary emphasis is on early impact technology, e.g., heating and cooling of residential and commercial structures with some emphasis on crop drying and wind machines as technology becomes available. The goal is to achieve early commercialization via industry/market/user stimulation. The solar energy group is currently being integrated into a commercialization directorate in the DOE. It was formerly located in a technology division and had been located in an administrative division. The group uses leveraging to increase the effectiveness of its limited funds rather than formal cost sharing. By leveraging is meant the coordination of programs and grants such that projects share overhead and resources. Examples are: National Solar Heating and Cooling Information Center, funded by HUD; The Solar Energy Research Institute, funded by DOE (has five divisions; Research; Analysis and Assess; Information, Education, International Programs; Technical Commercialization; and Technical and Administration). MITRE is conducting a study to provide an assessment methodology for effectiveness and efficiency; a computerized model is envisioned.

Geothermal Energy

The major problems currently experienced are legal rather than technical as the laws are unclear whether geothermal resources are mineral or water resources. The goal is to resolve the legal problems to provide private capital incentives for investment while pursuing other incentives such as a loan guarantee program and technical developments. By the year 2000 of the geothermal energy production, it is hoped that $\sim$ 1/3 will be used for electricity, $\sim$ 1/3 in direct (process) use and $\sim$ 1/3 will be available as methane gas from the geothermal structure.

It is too early to assess effectiveness of the various approaches being used.

8. UNIVERSITIES: Pilot programs at university locations.

9. INDUSTRY: Program to incorporate industry needs, investigate barriers (particularly to geothermal energy use) and provide incentives to commercialization of products.

10. PRINCIPAL USERS: Industry, Federal, state and local governments, scientific community.

11. DURATION: Undetermined

12. SCOPE:

Solar: 1978 and prior, $2 million, 1979 request $6.5 million; funding includes staff of seven plus Integrating Contractor.

Geothermal: ~ $500/year; funding includes staff of three.

13. CONTACT:

Solar: Mr. Lawnie Taylor, Technology Transfer Branch, Division of Solar Energy, (202) 376-9146

Geothermal: Mr. Henry Rosenthal, Industrial Relations Branch Division of Geothermal Energy, (202) 376-4578

1. AGENCY: Environmental Protection Agency

2. BUREAU/ADMINISTRATION: Technology Transfer Office

3. OFFICE/PROGRAM: Technology Transfer Office

4. TECHNOLOGY FIELDS: Emerging technology in municipal and industrial waste control, environmental standards, impact, resource development management

5. PRODUCTS TRANSFERRED: Information, techniques, R&D results, demonstration results

   Major emphasis is on document/standards preparation to disseminate new technology as rapidly as possible. The major stated objective is to prevent investment in obsolescent/obsolete technology because of poor data dissemination. The EPA is very effective in TT since it both funds R&D and sets standards.

6. APPLICABILITY TO OSTA: The technology transfer mechanisms are potentially applicable. Major interest stems from contacts with local governments and industry.

7. MECHANISMS: Ten regional EPA offices focus efforts of 15 EPA laboratories on user needs. Publications, handbooks, demonstration projects, seminars (industrial and municipal), design manuals, audio-visual material, professional societies.

8. UNIVERSITIES: Land grant universities (e.g., Oklahoma) and Agricultural Extension Services will be tapped for information transfer.

9. INDUSTRY: State, local and industry demonstration projects are Federally funded; usually only a portion of the total requirement is funded and the demonstration stops when the funds run out.

10. PRINCIPAL USERS: Consultants, state and local design engineers, environmental agencies, administrative decision-makers, special interest groups.

11. DURATION: Undetermined

12. SCOPE: The Environmental Research Information Center, $3 million per year; staff of 27; no other formal TT organization.

13. CONTACT: Mr. R. E. Lowe, Director, Technology Transfer Program, Cincinnati, Ohio, (513) 684-7394.

1. AGENCY: Health, Education, Welfare

2. BUREAU/ADMINISTRATION: National Institutes of Health

3. OFFICE/PROGRAM: Technology transfer activities are focused in Medical Applications Research Office. Focal point for medical information is National Library of Medicine

4. TECHNOLOGY FIELDS: Medicine, medical techniques, disease control, prevention

5. PRODUCTS TRANSFERRED: Information, techniques, hardware, research results, drugs, medicines

6. APPLICABILITY TO OSTA: The transfer mechanisms are potentially applicable; interest also stems from NASA's involvement with biomedical instrumentation and space medicine.

7. MECHANISMS: Publications, conferences, seminars, journals, computer searches, specific topical searches, demonstration projects (SATCOM), films, audio-visual material, hardware development.

Dr. Seymore Perry is responsible for medical applications research within the Directors Office of NIH. This function may soon become a full office, as a result of a proposal to establish a central medical applications office within NIH at an initial level of $600K to $1 million per year.

The basic function of the current program is to take emerging technologies such as those in clinical trials (which may range from devices to techniques or even drugs) and perform a consensus exercise, or critical review which will result in a catalyst for transferring the technology from research to practice. The mechanism is a panel of advisors including industry, regulatory, scientific, medical, legal and other interested groups to critique the research and its potential application. This interface between applications and research serves to act as a check on practical applications of the technology compared to existing technologies, and to direct attention to areas which require further research; that is, provide feedback into the NIH programs. Consensus of the panel is widely disseminated in both the press and professional journals.

Though each institute has its own independent technology transfer activities (e.g., the Heart and Lung Institute medical devices program), the central medical applications program represents the entire NIH with representatives to the

program meeting each month to establish guidelines and maintain surveillance of emerging technologies. The central program generally will conduct consensus exercises for programs which cut across discipline interests of the various institutes or which have high national sensitivity.

8. UNIVERSITIES: Support of research (extramural R&D, $1.7 billion), clinical institutions, and regional centers.

9. INDUSTRY: Participation in bringing products to market, development support.

10. PRINCIPAL USERS: Scientific and medical community.

11. DURATION: A proposal has recently been submitted to HEW to establish applications research as an office separate from the director's office where it is currently located.

12. SCOPE: Budget will be approximately $1 million per year.

13. CONTACT: Dr. Seymore Perry, Medical Applications Research, NIH Director's Office, (301) 496-2500.

1. AGENCY: Health, Education, Welfare

2. BUREAU/ADMINISTRATION: Public Health Service

3. OFFICE/PROGRAM: Health Services Administration

4. TECHNOLOGY FIELDS: Health delivery programs

5. PRODUCTS TRANSFERRED: Information, techniques, program assistance, health programs

6. APPLICABILITY TO OSTA: Major interest comes from NASA involvement in biomedical research.

7. MECHANISMS: Funding of health care demonstration projects, direct care services, information services, research dissemination (involved in ATS-6, STARPAHC).

Health Services Administration is currently involved in an inter-agency committee on technology transfer organized by the T. U. office within NASA (Mogavero). This came about as a result of a letter written to Joseph A. Califano, Secretary, HEW, by the NASA Administrator.

Ruth Hampt, Office of Planning, HEW, has recently assembled a 5-year plan for the HEW which specifically addresses technology transfer as an agency initiative. Lowell Harmison, Public Health Services, will be primarily responsible as the agency representative in technology transfer. The planning is formative at this time, though three areas form the nucleus of the plan: (1) investigation of the issues involved in technology transfer, (2) the influence of the technology transfer process on health care cost, quality, and efficiency, and (3) the stimulation of the private sector by various initiatives such as exclusive licensing arrangements.

8. UNIVERSITIES: NA

9. INDUSTRY: NA

10. PRINCIPAL USERS: Local health services, state agencies.

11. DURATION: New central technology transfer initiative within HEW.

12. SCOPE: Funding not yet finalized.

13. CONTACT: Dr. William Jemma, Chief, Office of Planning, Evaluation, and Legislation, Health Services Administration, (301) 443-2460

Ruth S. Hampt, Director of Policy Development and Planning, Public Health Service, (301) 245-1824

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Mr. Lowell Harmison, Public Health Service

Harmison has been meeting with NASA officials (E. Gray) as part of the NASA program to stimulate transfer of NASA technology into other agencies. Two projects which have involved NASA include ATS-6 and the STARPAHC Program.

1. AGENCY: Housing and Urban Development

2. BUREAU/ADMINISTRATION: Policy Development and Research (PD&R)

3. OFFICE/PROGRAM: Division of Product Dissemination and Transfer

4. TECHNOLOGY FIELDS: Housing research, community development research, residential solar heating and cooling program

5. PRODUCTS TRANSFERRED: Information, techniques, technical assistance

6. APPLICABILITY TO OSTA: The program uses a wide variety of innovative transfer mechanisms and involvement with local governments, industry and individuals.

7. MECHANISMS: Use of technology transfer contractor (Public Technology, Inc.), publications, R&D performance and demonstration projects, brochures, audio-visual films, workshops, symposia, one-on-one meetings, local government utilization of university resources

Division of Product Dissemination and Transfer is engaged primarily in developing and demonstrating new mechanisms to disseminate information on the broad areas of interest to HUD. The office has a program budget of $600,000 and a staff of two professional and two clerical. Most of the program funds are leverage money and are combined with other HUD funds to produce an actual technology dissemination program of 2-5 times this size. In addition to the mechanisms used above, two principle programs exist within HUD aimed at technology transfer to state and local government:

Urban Observatory Program

Three-year effort ended in December 1977; $1 million per year contract with National League of Cities. Subcontractors in each of the 10 medium size cities handled local effort. The program was designed to bring local government together with local area universities to solve local problems where research capability could be brought to bear. Projects ranged from solid waste disposal and other technical topics to socio-economic studies. The local government cost-shared the project at the university with HUD according to the following:

First year: 3/4 HUD - 1/4 local
Second year: 2/3 HUD - 1/3 local
Third year: 1/2 HUD - 1/2 local

At program end, many cities are converted to ongoing programs, funded entirely by the cities. This program was preceded by a

large-city experiment which ended in 1974. Many cities have formed ongoing arrangements in this experiment also. The local contractor determined which state projects would be funded, a major consideration being faculty to perform the research in a particular area of expertise.

Technical Assistance to State and Local Governments (new HUD initiative)

This program is a special initiative out of the director's office, and comes under Mr. Howard Ball. The program is in final planning stages and may change somewhat before implementation in June 1978.

Level of funding is $10 million/year in program funds, with a central office staff of three persons additional. The program provides three mechanisms for technical assistance to block grant (community development block grants) recipients in the conduct of block grant activities:

(1) States may submit proposals to study/solve technical problems. $3.5 million is available for this.
(2) Quick-response mechanisms will be established in 10 regions. Funding will be $1.5 million on bid to contractors (which may be university, state agency, or private). Design is for quick response to state/local problems.
(3) HUD headquarters program to study problems arising from (1) and (2) which are national in scope. This will involve research, workshops, seminars, conferences, publication, and so on.

The program is geared largely to the needs of cities and communities receiving block grants. Specific feature of program is that local communities can submit proposals/requests for information on technical assistance areas of concern to them, not dictated in advance. Areas may range from highly technical to socio-economic.

8. UNIVERSITIES: Two specific programs: (1) Urban Observatory Program, and (2) Technical Assistance to State and Local Governments.

9. INDUSTRY: Use of industry associations (home builders, architects).

10. PRINCIPAL USERS: State and local government officials, building trades, home owners.

11. DURATION: Technical assistance tc state and local governments will be a new initiative.

12. SCOPE: Scope of PD&R Office includes all demonstration (as opposed to ongoing) programs and will be $600K in 1978 and about $1 million in 1979. Most of the funds are used as leverage money to initiate programs with other HUD divisions which provide resources and manpower.

The technical assistance to state and local governments, a new HUD initiative will have a funding level of $10 million per year in program funds with a staff of three persons additional.

13. CONTACT: Ms. Heather Aveilhe, Director, Division of Product Dissemination and Transfer PD&R Office

Mr. Earl Linbert, Urban Observatory Program, 755-6230

Mr. Ed Finnegan, Planning, HUD Director's Office, Technical Assistance to State and Local Governments, (202) 755-5970

1. AGENCY: Interior

2. BUREAU/ADMINISTRATION: Office of Library and Information Services

3. OFFICE/PROGRAM: Natural Resources Library and Information System

4. TECHNOLOGY FIELDS: Conservation and development of natural resources, including mining, engineering, science, recreation

5. PRODUCTS TRANSFERRED: Information

6. APPLICABILITY TO OSTA: The program is an example of a centralized information system bringing together the information requirements and research efforts of over 60 separate entities within the Department of Interior which allows an outsider to access information across the entire agency.

7. MECHANISMS: Computer search services link over 60 specialized on-line data bases in government and industry. Bibliographies and topic overviews.

The Natural Resources Library of the Department of Interior serves as a central library and information clearinghouse for over 200 libraries within the various Bureaus of Interior.

The main library has a budget of $2 million funded out of the secretary's budget. About $.25 - $.50 million of the budget is spent on information transfer within and between the bureaus and the public. An on-line data base links some 60 data bases in Interior and throughout the government (including NTIS and Smithsonian) and also has 60 commercial data bases accessible. Computerized searches are performed by technical specialists within the main library for the entire department. Search requests may also initiate with state and local government, academic, or industrial users. The main library draws support extensively from the other bureaus both in terms of manpower and hardware. For example, the computer system supporting the operation are not charged to the library budget. Searches for commercial users are performed on a reimbursable basis.

8. UNIVERSITIES: NA

9. INDUSTRY: NA

10. PRINCIPAL USERS: Federal, state and local governments, academic, industry, scientific, engineering communities.

11. DURATION: Since 1975

12. SCOPE: Budget about $3 million per year including staff support. About $.50 million is spent on information transfer activities.

13. CONTACT: Mrs. Mary A. Butler, Director, Library and Information Services, (2) 344-5821

1. AGENCY: Interior

2. BUREAU/ADMINISTRATION: U.S. Fish and Wildlife Service

3. OFFICE/PROGRAM: Biological Services Offices/Information Transfer Project (ITP)

4. TECHNOLOGY FIELDS: Land and water resource use and development, fisheries, wildlife, fish and wildlife resources management and conservation

5. PRODUCTS TRANSFERRED: Research results, information, economic and ecologic assessments of resource development

6. APPLICABILITY TO OSTA: The service is adapting remote sensing; supports a substantial information service; and has extensive relationships with local governments which can be used by OSTA.

7. MECHANISMS: Research conduct and dissemination, information specialists as part of research team, regional agents, manuals, guidelines, publications, computer data bases: SSIE, NTIS, water research information center, Library of Congress, TRIS, workshops, technical meetings, newsletters, training courses.

The biological services office has a staff of 170 people with a charter of developing and providing the Fish and Wildlife Service, other Federal agencies, and state agencies with better informational inputs to decisionmaking in the area of developmental impacts on fish and wildlife ecology. The office identifies major issues in inland and coastal development activities, develops and manages study programs to examine these issues, and provides technical assistance and training to planning agencies. The research group is organized around five ecological areas:

(1) Instream flow group
(2) Energy and land use
(3) Stream alterations
(4) Power plant team
(5) Wetlands inventory group

An Information Transfer Project (ITP) has been initiated to plan for more active technology transfer between the research group and users. The focus is to integrate technology transfer into the R&D program by assigning technology transfer responsibility to each research project. Technology transfer is considered an integral part of the R&D planning. The ITP has an annual funding level of $800,000, and has provided technology transfer planning for biological services programs.

Using a support contractor, policy and procedures guidelines have been developed for the services' R&D programs and pilot programs have been conducted to determine optimum mechanisms for training and dissemination to a wide range of users from state agencies to utilities and other developers. Workshops, manuals, and other tools have been developed for state and industry involvement in ecology planning.

A mechanism which has been developed by the ITP is the establishment of regional teams in each of seven fish and wildlife regions. The teams consist of an information transfer specialist, and a technology transfer generalist acting as a regional activity leader. These teams will interact with states and industry within the region to:

(1) Establish user needs and priorities
(2) Communicate needs back into the research branches of the fish and wildlife service
(3) Oversee the development of research results or new technology
(4) Communicate the technology back to the user
(5) Evaluate the application of the technology with specific users.

The regional team program will have a budget of $1 million and will utilize a range of mechanisms from media to workshops to communicate with users in each region.

It might be noted that the Fish and Wildlife Service is currently planning a SEASAT experiment with NASA.

8. UNIVERSITIES: NA

9. INDUSTRY: NA

10. PRINCIPAL USERS: Federal, state and local government resource and planning agencies, scientific community, industry.

11. DURATION: Since 1975

12. SCOPE: The Biological Services Office has a budget of $12 million. Of this, the ITP has a budget of $800,000 with assistance of a support contractor. The regional program is budgeted at $1 million.

13. CONTACT: Dr. Allan Hirsch, Chief, Biological Services Office, (202) 634-4900

Mr. Charles Chapman, Deputy, Biological Services Office, (202) 634-4913

Mr. Bernie Dennis, Chief, ITP Program and Regional Team Program, (202) 634-4910.

1. AGENCY: Interior

2. BUREAU/ADMINISTRATION: U.S. Geological Survey

3. OFFICE/PROGRAM: Land Resources/Land Information Analysis Office (LIA)

4. TECHNOLOGY FIELDS: Topographic surveying and mapping, mineral and geological resources, water resources, conservation, Earth sciences

5. PRODUCTS TRANSFERRED: Information, techniques, R&D results, maps, charts, ERTS data.

6. APPLICABILITY TO OSTA: The program is involved in remote sensing, and innovative technology transfer mechanisms, and contacts with local governments and industry.

7. MECHANISMS: Publications (papers, bulletins, circulars, maps, atlases, journals, reports), training courses, conferences, seminars, technical assistance, inter-agency cooperative programs, state offices, regional centers, international training programs

The Land Information and Analysis Office is the focal point for technology transfer from USGS to the land resource planning community. It should be noted that the four divisions (geological, conservation, topographical, and resources) comprising USGS have operational responsibilities in technology transfer, and from within each division the focal point for technology transfer and information exchange with the scientific community. The scope of these TT activities is large, but not quantifiable.

Within the Land Information and Analysis Office, five programs form the nucleus of the technology transfer activity. Though the office itself has been in existence for 2 years, many of the programs were started before the formation of the office. Funded out of the Director's Office, the LIA budget is about $17 million per year, which includes a core staff of about 60 people. The five programs are:

(1) EROS
(2) Geography
(3) Resource and Land Investigation (RALI)
(4) Earth Science Applications (ESA)
(5) Environmental Impact Analysis (EIA)

These programs have two common elements; (1) they cut across several divisions within USGS, and (2) they form interfaces between USGS and the land resource planning community.

EROS operates the EDC facility at Sioux Falls (which, with the exception of management personnel, is contractor operated). EROS interfaces with state, local, and regional agencies on a variety of programs. One such program is the joint NASA-EROS program with the Pacific Northwest Commission (Idaho, Oregon, Washington) which is geared toward training state persons in the use of remote sensing, aerial surveys, and ground truthing in various combinations. This training is geared to needs in diverse areas such as state forestry, fish and wildlife, agriculture, and so on. The EROS budget is approximately $8.6 million, which includes the Sioux Falls operation.

The Geography program is a program designed to provide uniform nationwide land use and land cover mapping at a scale of 1:100,000 over the entire United States in the next 5 years. Matching funds are supplied by the states along with state agency personnel. The program supplies education and training in production and use of the three-level classification maps. Landsat, aerial photography, and computer digital systems are used in the map production. Beyond Level 3, the state supplies its own classification scheme according to specific state requirements. Participation in the program is voluntary on the part of the states.

The Resource and Land Information program concentrates on the socio-economic aspects of new resource development, attempting to focus state and local planning on the broader aspects of resource development. A workshop series is used to develop lines of communication between planners and scientists. As an example, the workshop might focus on the implications of developing oil reserves off coastal waters of New Jersey. The program tries to develop the socio-economic impact of the activity on the coastal community, and give the planners the broad perspective required to control major variables. The ASOPO (American Society of Planning Officials), and publications are used, in addition to fact books and planning guides.

The Environmental Impact Analysis program is responsible for developing environmental impact statements on Federal projects for which the USGS is the lead agency.

The Earth Science Applications program has been operative since 1970 and has conducted six or seven major projects. The focus is on geological inputs to land use planners. The program demonstration projects relate geological information on such factors as drainage, slope, vegetation, and so on, to planning requirements at local levels. An example is the San Francisco Bay Area project which involved nine counties and Bay area governments. Initially the projects were totally funded by USGS, but now they are joint-funded and staff-shared activities. Another charter of the ESA operations is the

provision of alerts to potential geological hazards to communities. This covers hazard inputs to planning (e.g., landslide potential) as well as hazards eminent to the community such as floods or earthquakes.

8. UNIVERSITIES: NA

9. INDUSTRY: NA

10. PRINCIPAL USERS: Scientists, professionals (geology, hydrology, cartography), state and local planners, universities, private sector.

11. DURATION: The LIA office has been in operation since 1975, though some individual programs were started earlier.

12. SCOPE: The LIA budget is approximately $17 million per year. (See MECHANISMS, above, for further details)

13. CONTACT: Mr. James R. Balsley, Assistant Director for Land Resources, USGS, (703) 860-7488

Mr. Tom Bates, Land Information and Analysis Office, (303) 234-5900.

1. AGENCY: Interior

2. BUREAU/ADMINISTRATION: Bureau of Mines

3. OFFICE/PROGRAM: Mining Research Technology Transfer Group

4. TECHNOLOGY FIELDS: Mining, mine health and safety, environment, metallurgy, materials

5. PRODUCTS TRANSFERRED: Information, techniques, hardware

6. APPLICABILITY TO OSTA: The program has contacts with local governments and industry, and develops and transfers sophisticated hardware in joint industry programs which may be of interest to OSTA.

7. MECHANISMS: Development of commercial technology for transfer to industry, personal contacts with industry, manufacturers, state and federal agencies to determine need basis. Conferences, publications, demonstrations, displays/exhibits, cost-sharing, regulatory assistance, manufacturing liaison.

Technology transfer activities occur in two primary areas:

(1) Metallurgy
(2) Mining

Metallurgy

Primary mechanism is through research and demonstration projects, often jointly funded with industry. An example is recovery of aluminum by leaching, funded with 10 aluminum companies at $50,000 each, and $1 million from the Bureau of Mines. Most projects are problem-oriented (e.g., new material supply, solid waste cleanup, etc.) and process-oriented.

There are eight regional research facilities which tend to be discipline-oriented rather than regional-oriented, though some regional orientation takes place. About 100 different projects are going on currently, ranging in size from $12 million to $100,000.

Because of the cooperative cost sharing, most project results are self-disseminating, but other mechanisms are used as well:

(1) Informal linkages with geologists in both the government and industry
(2) Conferences and seminars, especially in conjunction with mining group

(3) Trade association liaisons, e.g., aluminum association
(4) Publications of research and demonstration results both as separate publications, and in professional literature
(5) Open house - annual series of briefings, tours, etc., of each of the regional laboratories to stimulate interest in transfer of work being done.

The budget for these activities is undetermined, primary transfer mechanisms are built into projects.

Mining

The major technology transfer effort of the mining research group takes place as an integral part of the project work. The projects are research, development, and demonstration, with a heavy emphasis on demonstration. The projects, where possible, are cost-sharing or cooperative projects with the manufacturing industry and the mining companies on equipment and techniques. The projects focus on key problems in the mining industry. Some inter-agency projects and state regulatory agency involvement occurs also.

In addition to the project work, a technology transfer group has been active since April of 1972, at a level of $.25 million per year and three additional full-time people and several additional part-time people at four research centers. The group conducts briefings and seminars throughout the U.S. on key topics in the mining industry. A mailing list of interested parties in industry and state agencies is maintained. The group also participates in exhibits and trade shows. The meetings throughout the U.S. also provide a two-way communication of industry needs and viewpoints back into the program. The group also prints a newsletter, Technology News Notes, for dissemination of information on new projects, techniques, and equipment.

8. UNIVERSITIES: NA

9. INDUSTRY: Cost-shared hardware development/demonstrations, feedback on R&D relevancy.

10. PRINCIPAL USERS: Mining industry, equipment manufacturers, state and federal regulatory agencies.

11. DURATION: Research and development activities with industry have long been an integral part of the Bureau of Mines programs. The mining research technology transfer group discussed above has been active since 1972.

12. SCOPE: Metallurgy R&D has a budget of about $25 million per year. Mining R&D has a budget of about $90 million per year, though about half of this is to be transferred to the newly formed Department of Energy.

13. CONTACT: Mr. Andrew Prokopovitsch, Staff Metallurgist, Bureau of Mines, (202) 634-1147

Mr. Philip G. Meikle, Mining, (202) 634-7119

1. AGENCY: Interior

2. BUREAU/ADMINISTRATION: Office of Water Research and Technology

3. OFFICE/PROGRAM: Technology Transfer Program

4. TECHNOLOGY FIELDS: Water and water resources related to water supply and water quality. Flood plain management information, techniques.

5. PRODUCTS TRANSFERRED: Information, techniques

6. APPLICABILITY TO OSTA: Applicable (remote sensing)

7. MECHANISMS: Joint research (problem oriented) with water resource institutes in each state, water research information system, information centers, abstracts, catalog of research, NTIS.

The Technology Transfer program of the Offic of Water Research and Technology has both an information system and an active program of technology transfer and research.

The information transfer system is a machine retrievable abstracting source for about 125,000 items in water resources. The system is hardwired to five university centers which are regionally dispersed, and is also accessable by phone-in from any location. The university information center has one person full-time and stimulates business by contacts within the region, ranging from mailings to word of mouth. Several types of cost recovery are being experimented with, ranging from full recovery to free services. The system is also linked to NTIS computers. Abstracts and publications, as well as books are available through the system in addition to computer searches. Catalogs of the system contents are maintained and widely distributed. The system currently operates with an annual budget of $1.2 million and has been in operation since 1965.

The University Institute Research program consists of one university in each state, and four territories. The 54 institutes submit proposals to the Office of Water Research for projects which are matched by state Department of Resources funds, or matched by industry funds. Some universities operate at a level of as much as $7 - $8 million of projects annually (Penn State). The research programs feed the technology transfer efforts of the Office of Water Research and Technology, and provide a link to the needs of state and local governments and industry.

A centralized technology transfer program funded at a level of $500,000 to $1 million includes the following activities:

(1) Seminars and workshops by subject matter
(2) Technical and semi-technical publications
(3) Manuals on a wide range of subjects from computer modeling to irrigation systems
(4) Demonstration projects which are funded as separate budget items (in addition to the $500,000 to $1 million technology transfer budget).

The Technology Transfer program is tied to the needs of potential users through the university institutes program, and is geared toward state and local water resource agencies, as well as with industry on programs such as renovating industrial wastewater. This program has been in effect since 1974. The office has requested Congress to provide an amendment to existing legislation which will allow the institutes to perform direct technology transfer activities by competitive proposal. This activity is expected to be funded at a level of $2 - $5 million per year.

8. UNIVERSITIES: Used as sites for state institutes.

9. INDUSTRY: Co-sponsored research programs on industrial recycling, waste, etc.

10. PRINCIPAL USERS: State water resource research institutes (WRSI), state and local agencies, Federal agencies.

11. DURATION: Information system, 10 years; active transfer program, 3 years.

12. SCOPE: Information system, $1.2 million per year; active transfer program, $.50 - $1 million per year.

13. CONTACT: Mr. Jack C. Jorgensen, Assistant Director, Technology Transfer, (202) 343-8445.

1. AGENCY: Justice

2. BUREAU/ADMINISTRATION: Law Enforcement Administration, National Institute of Law Enforcement and Criminal Justice

3. OFFICE/PROGRAM: Technology Transfer Division, Office of Technology Transfer

4. TECHNOLOGY FIELDS: Criminology, criminal justice, law enforcement, correctional programs

5. PRODUCTS TRANSFERRED: Information, techniques, R&D results

6. APPLICABILITY TO OSTA: The program is an excellent example of technology transfer oriented to the needs of state and local agencies.

7. MECHANISMS: Documents, training and demonstration programs, technology sharing programs, regional offices, audio-visual programs, monographs, research results reports, books, international clearinghouse (abstracts), special reports, personnel exchange equipment standards and evaluation

The three divisions of the Technology Transfer Office are: (1) model program development, (2) training, and (3) reference and dissemination.

Model program development consists of the following activities:

(1) Prescriptive packages - state of art review of specific topics, techniques, designed for input to state and local agency planning. The packages provide a broad perspective on various options, and include estimates of staffing and costs, and activities to be conducted in implementing the technique.
(2) Test design to validate concepts in law enforcement and criminal justice.
(3) Exemplary projects - experiences of state and local law enforcement in dealing with new approaches and techniques are solicited. LEA does not pay the local agency to perform the project, but encourages the local agencies to share their successes with other communities. This is done by LEA documenting the local effort, and by subsequent wide dissemination of the documentation by mail. The local agency then becomes a luminary in the field.

Training and testing consists of the following activities:

(1) Test designs as discussed above are implemented in local communities, usually in about three communities simultaneously. The implementation is funded by LEA, and if successful, the concept is exposed to other communities. LEA then conducts training programs to train other communities in the concept.
(2) Training for criminal justice is accomplished by series of regional workshops and symposia. These are single-topic, and highly applications-oriented. Fifty to sixty key local enforcement officials participate in each workshop, which is presented in 10 regions. Papers, training manuals, and other applications-oriented materials are used.
(3) Research community workshops - researchers in criminology, criminal justice, law enforcement, participate in discussions to put research efforts in proper focus. The workshops serve both to inform the research community, and to provide community inputs into LEA activities.
(4) An update of law enforcement techniques is presented each year in Washington at a mayors' conference.
(5) National conferences are conducted on matters of wide interest.
(6) Host program - LEA provides funds for 2 to 3 weeks of observation of exemplary programs as noted above. As an example, San Francisco sent observers to New York under the program to observe New York's street crime unit and subsequently establish their own program.

Reference and dissemination consists of the following activities:

(1) An automated abstracts library is maintained on areas related to law enforcement and criminal justice. Some 40,000 members have filled out an "interest profile", and are continually updated on new information in chosen topic areas. Printed matter is then available from LEA or GPO.
(2) A research bulletin is printed monthly.
(3) An annual review of criminal justice research is performed.
(4) An annual report of technology transfer activities is written.

8. UNIVERSITIES: NA

9. INDUSTRY: NA

10. PRINCIPAL USERS: State and local law enforcement agencies, Federal agencies, professional organizations.

11. DURATION: Undetermined.

12. SCOPE: The Technology Transfer Office within the Law Enforcement Administration has a three division program with an annual budget of $10 million (program funds) and a headquarters staff of 25 in addition to these funds.

13. CONTACT: Mr. Paul Cascanaro, Director, Technology Transfer Division, (202) 376-3723.

1. AGENCY: National Science Foundation

2. BUREAU/ADMINISTRATION: Research Applications Directorate

3. OFFICE/PROGRAM: Research Applied to National Needs (RANN) Program

4. TECHNOLOGY FIELDS: Broad based technology transfer experiments in areas of resources, environment, productivity, and very long-range research planning.

5. PRODUCTS TRANSFERRED: Techniques, hardware, information.

6. APPLICABILITY TO OSTA: The RANN program has extensively funded research into technology transfer with state and local government and industry. Many of the program results would be useful guides to possible activities to be undertaken by OSTA.

7. MECHANISMS: Funding of research grants, especially to facilitate innovative technology transfer mechanisms. Document center, publications, links with NTIS.

The RANN program serves as a bridge between NSF's basic research and the development of research utilization by Federal agencies, state and local governments, and industry. A primary goal of the program is to shorten the lead time between basic scientific discoveries and practical application. About $60 million in grants were funded under RANN in 1976.

The principal transfer method used is the inclusion in all RANN research grant proposals of a utilization plan which identifies the user groups and the utilization process and budget. User needs are integrated into the research effort. Projects supported by RANN fall outside the scope of other Federal agencies, or involve merging of responsibilities of two or more agencies. Projects are divided into four activity areas:

(1) Effective utilization of renewable and non-renewable natural resources.
(2) Analysis and elimination of natural and man-made environmental hazards.
(3) Improvement of service delivery in the public sector (Federal, state and local) by policy and technology and improvement of productivity in the industrial sector by technology and interaction of regulatory process and productivity.
(4) Technology assessment - long-range social, environmental and economic impacts of emerging technology.

The Office of Intergovernmental Science and Public Technology (ISPT) within RANN has two major thrusts:

(1) Integrate science and technology into program planning and executive activities of state and local governments.
(2) Test incentives for R&D investment in the private sector.

FY 1977 budgets were $3.6 million for intergovernmental activities and $1 million for industrial programs.

Under ISPT, a document center is maintained and a communications program has been implemented to:

(1) Establish innovative mechanisms for scientific products dissemination to diverse potential users.
(2) Interact with audiences concerned with public policy to anticipate future R&D needs.

State Planning Programs

Two of the programs under ISTP, the State Government Program and the State Legislature Program, are designed to investigate mechanisms for science and technology inputs to state planning. The legislative program is administered by the National Council of State Legislatures (NCSL) and provides $25,000 to each state (with $12,500 matching state funds) to investigate what mechanisms should be set up to formalize science and technology inputs into that state's legislative planning. Similarly, the state government program is administered by the National Governors' Association (NGA) and provides $25,000 to each state (with $12,500 matching state funds) to investigate what mechanisms are useful for science and technology inputs in the state executive branch.

8. UNIVERSITIES: Research funding - coupling of universities and small businesses as innovation centers as a small business resource.

9. INDUSTRY: Small business incentives, research funding.

10. PRINCIPAL USERS: Federal agencies, state and local government, industry.

11. DURATION: RANN - since 1972

12. SCOPE: RANN, $65 million per year; ISTP, $4.6 million per year.

13. CONTACT: Dr. Jack T. Sanderson, Director, Division of Intergovernmental Science and Public Technology, NSF, (202) 634-7672.

1. AGENCY: Small Business Administration

2. BUREAU/ADMINISTRATION: Office of Procurement and Technical Assistance

3. OFFICE/PROGRAM: Technology Assistance Program

4. TECHNOLOGY FIELDS: Federal technology, general from government contracts and Federal laboratories.

5. PRODUCTS TRANSFERRED: Information, techniques; related to high technology.

6. APPLICABILITY TO OSTA: NASA TU office currently participates in support of data base. SBA has contacts with industry and local governments.

7. MECHANISMS: Descriptive literature with reader service cards, personal contact, technical assistance and technology source location, computer searches, regional offices.

The Small Business Administration operates a network of eight regional offices under its Technology Assistance Program. A pamphlet describing the program is mailed directly to small businesses using Dunn & Bradstreet and other reference materials to obtain addresses. The pamphlet outlines the objective of the program which is to help the small businessman define technical problems, then reach into the Federal laboratory infrastructure to obtain technical expertise. Since Federal based and Federally contracted research is used as a base, the service is essentially free to the small businessman. The businessman applies for assistance by mailing the response card attached to the pamphlet back to the Technology Assistance Office in Washington.

The eight regional offices receive the responses for their region from a central file in Washington. The regional representative then helps the businessman define the problem and obtain technical reference material and assistance ranging from a technology survey to discussions with a scientist in one of the Federal laboratories, such as Bureau of Standards, for example.

In addition to links with NTIS, and the Federal laboratory network, the regional offices are linked to a number of technology data bases. Two of these, WESRAC (Western Research Applications Center, University of Southern California) and NERAC (New England Research Applications Center, University of Connecticut) are supported partially by SBA ($60,000/year) and by NASA out of the TU office. Over 82 files of technology resources can be accessed by the system.

Though the majority of SBA's Technology Assistance Offices are not affiliated with universities, some experience with this mechanism is being gained in Region 7 where the University of Kansas Center for Research is used as a transfer center.

8. UNIVERSITIES: Some used as regional offices.

9. INDUSTRY: Program oriented specifically toward small industry.

10. PRINCIPAL USERS: Small business.

11. DURATION: The current program has been in effect since 1975, though it was operated previously as the SBA Technology Utilization Program.

12. SCOPE: $1 million per year including staff.

13. CONTACT: Mr. Donald R. Templeman, Chief, Technology Assistance Division, (202) 653-6938.

Mr. Roger Harmison, Deputy, Technology Assistance Division.

1. AGENCY: Transportation

2. BUREAU/ADMINISTRATION: Federal Highway Administration, Urban Mass Transportation Administration, Federal Aviation Administration, Federal Railroad Administration, National Highway Traffic Safety Administration, Coast Guard, Materials Transportation Bureau

3. OFFICE/PROGRAM: Inherent in mission of each administration.

4. TECHNOLOGY FIELDS: Broad based related to transportation systems: planning, economics, hardware, software, materials, operations economics, engineering.

5. PRODUCTS TRANSFERRED: Information, techniques, hardware.

6. APPLICABILITY TO OSTA: In addition to many specific programs directly involving Federal agency/state agency interaction, technology areas of interest to OSTA include the Search and Rescue Program and a possible ocean surveillence satellite program currently involving OSTA.

7. MECHANISMS: R&D funding, co-sponsored R&D, state decisionmaker field support, information service (Transportation Research Information Services Network), state and local training programs, publications, new technology utilization programs aimed at state and local governments, demonstration programs.

The several administrations within DOT are individually responsible for TT activities. These are outlined by administration below:

Office of the Secretary

- Transportation Test Center, Pueblo, Colorado
- Transportation Systems Center, Cambridge, Massachusetts
- Transportation Research Activities Information Service
- Transportation Safety Institute

Systems studies, engineering, information exchange, reports, testing, information service (TRAIS), education courses and training aids.

Federal Highway Administration

R&D: Use/performance organization studies
Safety
Environmental compatibility
Reduced costs

Field staff, development of information packages, implementation packages, reports, information system (HRIS), planning and programming manual, training institute (National Highway Institute), local courses, cooperative investigations.

Urban Mass Transportation Administration

R&D: Mass transit technology

Research reports, 80 percent Federal funding of capital improvements; hardware development for local transportation systems; demonstration projects - information services, training, direct assistance.

Federal Aviation Administration

R&D: Air traffic control
Communications and navigation
Weather data and data collection
Airport design and operations
Aircraft safety
Environmental safety and pollution
Aviation medicine
Facilities engineering

Most R&D is for FAA internal use; NASA pursues R&D for aircraft development.

Direct assistance, information services, training for non-Federal personnel, R&D funding, grants.

Federal Railroad Administration

R&D: Improved rail freight service
Track structures
Freight car management
Safety
Policy planning

Direct assistance, training, R&D programs and grants.

National Highway Traffic Safety Administration

R&D: Near-term vehicle safety and design; therefore,
Long-term vehicle safety and design
Alcoholism studies (over half of deaths involve alcohol)

Direct assistance in highway safety programs, information services (HSIS), training, R&D programs.

U.S. Coast Guard

R&D: Safety

Rescue Vehicles
Reserve equipment
Safety equipment
Navigation aids

Environment

Oil and chemical spills and pollution

Decentralized TT for diffusion of new products from developments, information services, technical conferences, training programs, R&D program.

Materials Transportation Bureau

R&D: Hazardous materials transportation
Pipeline safety

Direct assistance, information services, training programs.

St. Lawrence Seaway Development Corporation

Analyses (economic)

Research reports, information services.

8. UNIVERSITIES: NA

9. INDUSTRY: NA

10. PRINCIPAL USERS: State departments of transportation, state highway departments, public service and utility commissions, planning organizations, private industry, universities.

11. DURATION: Ongoing programs.

12. SCOPE: Undetermined.

13. CONTACT: Dr. Alfonso B. Linhares, Chief, R&D Policy Analysis Division, DOT, (202) 426-4208.

1. AGENCY: Smithsonian Institution

2. BUREAU/ADMINISTRATION: Smithsonian Science Information Exchange, Inc.

3. OFFICE/PROGRAM: Research abstracts service

4. TECHNOLOGY FIELDS: Broad based Federal R&D programs

5. PRODUCTS TRANSFERRED: Information about ongoing research, bibliographic data.

6. APPLICABILITY TO OSTA: NASA research abstracts are included in the Smithsonian data base (see last paragraph under Mechanisms)

7. MECHANISMS: The Smithsonian Science Information Exchange is a non-profit corporation operated by the Smithsonian Institution. Services are performed on a cost-reimbursable basis.

The Exchange maintains a data base on ongoing research and development projects. Projects are mainly Federal (80 percent) and various institutions such as American Cancer Society and The Rockefeller Foundation make up the other 20 percent. Non-classified DoD research is also on the system. 120,000 projects are added each year, and 2 years of data remain on-line. Scope of research, agency, funding level, and investigator are among the items maintained. Historical files are available.

The system allows compilations and tabulations, and directories of specialized areas of research. About 90 percent of the system use is by the Federal sector. The Exchange has been in business since 1950, and the computer operation, since 1963. Users may access the system directly or write in for special requests.

The Exchange has a budget of about $100,000 per year for direct mail advertising, exhibits at professional meetings, and similar promotional activities.

NASA research appears on the system at the program level (information from RTOPS is captured) rather than the project level. If the information was available at the project level, NASA could take advantage of free worldwide dissemination of R&D activities of potential interest to outside users. Though more paperwork would be required, the potential benefits to technology transfer should be considered.

8. UNIVERSITIES: NA

9. INDUSTRY: NA

10. PRINCIPAL USERS: Federal, state and local, scientific communities.

11. DURATION: The Exchange has been in operation since 1950. Computer services have been in operation since 1963.

12. SCOPE: The annual budget is $13 million. A large portion of this is reimbursable for services performed on a cost basis. $100,000 per year is spent on promotional activities.

13. CONTACT: Dr. David Hersey, (202) 381-4211.

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APPENDIX C

SELECTED FEDERAL RESEARCH PROJECTS OF INTEREST TO OSTA

APPENDIX C

SELECTED FEDERAL RESEARCH PROJECTS OF INTEREST TO OSTA

The project descriptions presented in this Appendix have been selected from a survey of Federal Programs in Technology Transfer to State and Local Government performed for Battelle by The Smithsonian Science Information Exchange during September 1976.

Of the 226 abstracts in the original survey, 95 were selected on the basis of either general background that applies to OSTA technologies, or transfer in areas related to NASA activities. The abstracts were organized by agency within five major categories:

(1) Projects related to the general background, mechanisms, and theory of innovation and technology transfer

(2) Projects addressing general technology transfer activities to state governments

(3) Projects addressing general technology transfer activities to local governments

(4) Projects addressing transfer of specific technologies

(5) NASA projects.

A complete listing by category is presented in Table C-1, which includes brief project descriptions. The Smithsonian Science Information Exchange (SSIE) indexing number for each abstract is included for further reference.

TABLE C-1. LISTING OF SELECTED FEDERAL RESEARCH PROJECTS OF INTEREST TO OSTA

Abstract No.	Project	Funding ($)
	I. Projects Related To The General Background, Mechanisms, And Theory of Innovation And Technology Transfer	
1	Department of Commerce, National Bureau of Standards Innovation Studies (SSIE ZBA-5606-2)	Unknown
2	Department of Housing & Urban Development Interviews of Federal Agencies Concerned With Transfer of Research and Technology (SSIE CR-1265)	Unknown
3	National Science Foundation, Office of Expt. R&D Incentives Redeployment and the Dynamics of Change in Scientific and Technological Institutions (SSIE GSJ-34)	65,891
4	National Science Foundation, Office of Expt. R&D Incentives Examination and Evaluation of Selected Governmental Technology Transfer Programs (SSIE GSJ-28)	43,800
5	National Science Foundation, Office of Planning & Resource Management The Future Research Role of Universities (SSIE BJ-620)	198,880
6	National Science Foundation, Office of Planning & Resource Management Support of Committee on Public Engineering Policy (SSIE BK-719)	125,000
7	National Science Foundation, Expl. Res. & Prob. Assessment Assessment of the Effects of Major Innovations in Scientific and Technical Information Transfer (SSIE GSQ-1304)	82,350
8	National Science Foundation, Expl. Res. & Prob. Assessment Background, Theory, and Methodology Studies (SSIE GSQ-1307)	25,300

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
9	National Science Foundation, Office of National R&D Assessment The Innovation Process in Public Organizations - Developing and Testing a Process Model of Adoption and Implementation (SSIE GSZ-66)	91,400
10	National Science Foundation, Office of National R&D Assessment Adoption and Utilization of Urban Technology - A Decision-Making Study (SSIE GSZ-62)	99,950
11	National Science Foundation, Office of National R&D Assessment Technological Diffusion in the Hospital Sector (SSIE GSZ-50)	48,400
12	National Science Foundation, Division of Science Information Analysis of Critical Issues in the Transfer of Scientific and Technical Information (SSIE GSN-2096)	98,300
13	National Science Foundation, Division of Science Information An Investigation of Planning Requirements and Priorities of Scientific and Technical Information Community (SSIE GSO-96)	132,300
14	National Science Foundation, Division of Science Information An Idealized Design of a National Scientific Communication and Technology Transfer System (SSIE GSN-1891-1)	105,000
	II. Projects Addressing General Technology Transfer Activities to State Governments	
15	Department of Commerce, National Bureau of Standards Invention Programs (SSIE ZBA-6637)	Unknown

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
16	Department of Commerce, National Bureau of Standards Invention Programs (SSIE ZBA-5607-2)	Unknown
17	National Science Foundation, Office of Expt. R&D Incentives Experimental Implementation of a Federal/State Technology Transfer Mechanism (SSIE GSJ-64)	135,500
18	National Science Foundation, Office of Expt. R&D Incentives Experimental Legislative Office of Technical Assistance (SSIE GSJ-18-2)	65,940
19	National Science Foundation, Office of Expt. R&D Incentives Background Study to Develop Methodology for Increasing Effectiveness of Technology Applications by State/Regional/ Local Agencies (SSIE GSJ-7-1)	110,000
20	National Science Foundation, Office of Expt. R&D Incentives Developing a Prototype Strategy for a Cooperative State-Local Government Urban Innovations Network (SSIE GSJ-48)	141,900
21	National Science Foundation, Office of Expt. R&D Incentives Study and Planning Project to Develop a Design for a Technology Delivery System in the Rocky Mountain Region (SSIE GSJ-46)	46,200
22	National Science Foundation, Office of Expt. R&D Incentives Definition Study - Interplan Communication and Motivation, Phase II (SSIE GSJ-45)	58,100
23	National Science Foundation, Division of Intg. Science & Pub. Technology State Legislatures, Science and Technology (SSIE GSQ-749-2)	65,000

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
24	National Science Foundation, Division of Intg. Science & Pub. Technology Implications of the New York State Legislative Science and Technology Project for Legislatures in the United States - A Manual (SSIE BU-962)	40,000
25	National Science Foundation, Division of Intg. Science & Pub. Technology Creation and Implementation of an Executive Science Advisory Mechanism (Phase II) (SSIE GSQ-1322-1)	89,900
26	National Science Foundation, Division of Intg. Science & Pub. Technology Implementation of an Experimental Federal-State Technology Transfer Mechanism (SSIE GSJ-62-2)	75,000
27	National Science Foundation, Office of Intergovernment Science & Research Center for the Study of Science Policy (SSIE GSQ-359-2)	40,000
28	National Science Foundation, Office of Intergovernment Science & Research A State and Local Government - Technology Information Exchange (SSIE GSQ-750-1)	170,000
29	National Science Foundation, Office of Intergovernment Science & Research Developing Science and Technology Utilization Through the Massachusetts Legislature (SSIE GSQ-1043)	45,000
30	National Science Foundation, Office of Intergovernment Science & Research The Human Resource Element of the State Government Innovation Process in Energy, Environment, and Productivity (SSIE GSQ-1032)	30,000

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
31	National Science Foundation, Office of Intergovernment Science & Research Establishment of a California Intergovernmental Science and Technology Program (SSIE GSO-824)	135,000
32	National Science Foundation, Office of Intergovernment Science & Research State Government Program Innovation Transfer Project (SSIE GSQ-1370)	33,400
33	National Science Foundation, Division of Science Information Assessment of Scientific and Technical Information Use in the Public Sector (SSIE GSX-2033)	46,300
34	Energy Research & Development Administration, Unspecified Unit Technology Transfer to Industry and Others (SSIE BJ-416-1)	Unknown
	III. Projects Addressing General Technology Transfer Activities to Local Governments	
35	Department of Housing & Urban Development Hud-Urban Information Systems Inter-Agency Committee (USAC) (SSIE GR-595-1)	350,000
36	National Science Foundation, Division of Advanced Products Research & Technology Development and Utilization of Urban Information Resources (SSIE GSQ-1121-1)	165,840
37	National Science Foundation, Division of Advanced Products Research & Technology Evaluation of Information Technology in Local Government (SSIE GSQ-1376)	248,088

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
38	National Science Foundation, Division of Advanced Products Research & Technology Research on Equipment Technology Utilized by Local Government - Fire Suppression Research Operations (SSIE AW-715)	164,473
39	National Science Foundation, Office of Expt. R&D Incentives Research on Federal Technology Assistance to State and Local Governments as Innovation Strategies - A Study for Improving Present Policy (SSIE GSJ-70)	65,000
40	National Science Foundation, Office of Expt. R&D Incentives An Experimental Program for Technology Use by Government Units (SSIE GSJ-39-2)	184,600
41	National Science Foundation, Office of Expt. R&D Incentives Study of a City Based Technology Transfer Center to Serve a Region (SSIE GSJ-75)	45,000
42	National Science Foundation, Division of Intergovernment Science & Public Technology The Urban Consortium for Technology Initiatives (SSIE BU-116)	167,200
43	National Science Foundation, Division of Intergovernment Science & Public Technology Stimulating Technology Applications and Utilization in Smaller Units of Local Government (SSIE GSJ-3-2)	199,300
44	National Science Foundation, Division of Intergovernment Science & Public Technology Local Government Management Innovation Transfer Project (SSIE GSQ-1044-2)	22,300
45	National Science Foundation, Office of Intergovernment Science & Research Totem One Program-Technical Integration Into City Operations (SSIE GSQ-358-3)	30,000

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
46	National Science Foundation, Office of Intergovernment Science & Research Technology Transfer Field Representative Program (SSIE GSQ-1143)	32,000
47	National Science Foundation, Office of Intergovernment Science & Research Local Use of Federal Laboratories (SSIE GSQ-1413)	60,000
48	National Science Foundation, Office of Intergovernment Science & Research Scientific and Technological Innovations Program (SSIE GSQ-1398)	25,000
49	National Science Foundation, Office of Intergovernment Science & Research Local Government Management Technology Exchange (SSIE GSQ-1359)	150,000
50	National Science Foundation, Office of Intergovernment Science & Research Transferring Evironmental Technology to Local Governments - A Test of Cooperative Extension Service Capability (SSIE GSQ-1326)	129,000
51	National Science Foundation, Office of Intergovernment Science & Research Local Government Technical Assistance (SSIE GSQ-1324)	18,300
52	National Science Foundation, Office of Intergovernment Science & Research Science & Technology Utilization Council of Milwaukee (SSIE GSQ-1188)	36,200
53	National Science Foundation, Office of Intergovernment Science & Research California Innovation Group (CIG) (SSIE GSQ-1112-1)	311,400
54	National Science Foundation, Office of Intergovernment Science & Research Information and Technology Exchange in Management and Productivity (SSIE GSQ-1045-1)	50,000

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
55	National Science Foundation, Office of National R&D Assessment The Use of New Technology to Deliver Local Services - An Assessment of Case Studies (SSIE GSZ-45)	99,500
56	National Science Foundation, Office of National R&D Assessment Diffusion of Technology in Municipal Governments (SSIE GSZ-39)	119,300
57	National Science Foundation, Office of National R&D The Adoption of Innovation by Local Government (SSIE GSZ-31)	54,700
	IV. Projects Addressing Transfer of Specific Technologies	
58	Department of Commerce, National Bureau of Standards Technology Transfer (SSIE ZBA-7004)	33,000
59	Department of Commerce, National Bureau of Standards Buildings Standards, Improvement & Implementation (SSIE ZBA-6993)	282,000
60	Department of Commerce, National Bureau of Standards Fire Services - Management Aids (SSIE ZBA-6605)	100,000
61	Department of Commerce, National Bureau of Standards Energy Conservation Information (SSIE ZBA-5938-1)	50,000
62	Environmental Protection Agency, Office of R&D Funding for the Committee on Remote Sensing Programs for Earth Resources Survey (SSIE A0-21139)	Unknown
63	Department of Health, Education & Welfare, Social & Rehabilitation Serv., Office of Res. Demons. & Trng., Research & Trng. Centers Division Rehabilitation Information Exchange and Clearinghouse Program-Dissemination of Research Findings (SSIE GWB-1399)	72,040

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
64	Department of Housing & Urban Development Feedback on Jersey City OBT (SSIE GR-912)	50,000
65	Department of Housing & Urban Development Minus - Total Energy Demonstration (SSIE GR-864-1)	745,000
66	Department of Justice A Quality Control Model for Facilitating the Transfer of Technology (SSIE GGA-561)	146,782
67	Department of Justice Massachusetts Law Enforcement Science Adviser Program (SSIE GGA-551)	21,232
68	Department of Justice Prescriptive Program Packages (SSIE GGA-541)	396,876
69	National Science Foundation, Div. Adv. Energy Resources Res. Application Study of Wind Power Technology to a Small City (SSIE AY-63)	93,500
70	National Science Foundation, Div. of Adv. Prod. R&T The Diffusion and Adoption of Scientific Innovation - Experience With a Telemedicine System (SSIE GSQ-1423)	73,600
71	National Science Foundation, Office of Expt. R&D Incentives An Experiment in Incentives - The New England Energy Development Systems Center (SSIE GSJ-59-1)	300,000
72	National Science Foundation, Office of Expt. R&D Incentives Medical Instrumentation Experiment in Ultrasonic Imagery (SSIE GSJ-58-2)	600,000
73	National Science Foundation, Division of National & International Prg. Study Design of a National Information Center on Renewable Energy Sources (SSIE GSX-2011)	100,000

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
74	National Science Foundation, Office of Public Tech. Proj. Utilization of Solar Energy and Energy Conservation Measures in a State-Supported Housing Project for the Elderly in Connecticut (SSIE AX-867)	131,200
75	National Science Foundation, Div. of Science Information Evaluation of the Impact of Natural Resource Information on Land-Use Decision Making (SSIE GSN-2028)	53,500
76	Postal Service Project Mailnet (SSIE AW-597)	30,000
77	Department of Transportation, System Dev. & Tech. Office New Perspectives on Urban Transportation: Strategies for Overcoming Barriers to Innovation (SSIE GZ-58836)	Unknown
78	Department of Transportation, Office of the Secretary The Workshop/Seminar Program (SSIE GZ-48811)	47,757
79	Department of Transportation, Office of the Secretary Technology Sharing Program (SSIE GZ-45488)	200,000
80	NASA, Aeronautics & Space Tech. Office, Ames Research Center Technology Assessment of Intercity Transportation Systems (SSIE ZH-40922-2)	Unknown
81	NASA, Aeronautics & Space Tech. Office, Ames Research Center Western Regional Applications Development (SSIE ZH-6417)	Unknown
82	NASA, Aeronautics & Space Tech. Office, Langley Research Center Technology Applications to Environmental Problems (SSIE ZH-31450)	Unknown

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
83	NASA, Manned Space Flight Office, Lyndon B. Johnson Space Center Transfer of Remote Sensing Analysis Technology Via Computer Time-Sharing Organizations (SSIE ZH-41613)	Unknown
84	NASA, Manned Space Flight Office, Lyndon B. Johnson Space Center Regional Applications Project (SSIE ZH-41635)	Unknown
85	NASA, Manned Space Flight Office, Lyndon B. Johnson Space Center Regional Applications Exploratory Study Project (SSIE ZH-6471)	Unknown
86	NASA, Space Science Office, Goddard Space Flight Center Regional Applications Development (SSIE ZH-6686)	Unknown
87	NASA, Manned Space Flight Office, Marshall Space Flight Center Demonstration of Applicability of NASA Data Acquisition and Management Processes to Resource Management Problems in Atchafalaya River Basin (SSIE ZH-41655)	Unknown
88	NASA, Organization & Management Office, University Affairs Office Biomedical Technology Transfer (SSIE GH-11109-2)	200,000
89	NASA, Organization & Management Office, University Affairs Office The Collection and Analysis of Information Relating to Technology Transfer and Application (SSIE GH-14102)	100,000
90	NASA, Organization & Management Office, University Affairs Office Program for Transfer Research and Impact Studies (SSIE GH-14914)	225,000

TABLE C-1. (Continued)

Abstract No.	Project	Funding ($)
91	NASA, Organization & Management Office, University Affairs Office Applications of Satellite Technology for Regional Organizations (SSIE GR-15425-1)	39,982
92	NASA, Organization & Management Office, University Affairs Office Regional Dissemination Center Operations Support (SSIE GR-15684)	325,228
93	NASA, Organization & Management Office, University Affairs Office Collection and Analysis of Information Relating to Technology Transfer and Application (SSIE GR-16307)	350,000
94	NASA, Space Science Office, Wallops Station Major Applications Demonstration (SSIE ZR-31554)	Unknown
95	National Science Foundation, Office of Expt. R&D Incentives Study of Federal Resources, Mechanisms, and Barriers Regarding Providing Technical Assistance to the States of Louisiana and Mississippi (SSIE GSJ-25)	83,572

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