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Implementation of the Technology Transfer Act: A Preliminary Assessment

Statement of
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Before the
Subcommittee on Science, Research, and Technology
Committee on Science, Space, and Technology
House of Representatives

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE: I welcome this opportunity to contribute to the Subcommittee's deliberations on using our nation's basic and applied research to improve our competitiveness in world markets. The process by which scientific research and development is transformed into commercially viable products and services has come to be known as "technology transfer." The Congress has long recognized that one way to improve technology transfer is to draw upon the basic scientific research and development strengths of our federally supported laboratories.

In the following testimony, we present (1) a brief summary of the legislative history of and congressional interest in federal technology transfer, (2) background information on how we developed a reporting system to collect information on federal agency and laboratory implementation of the legislation, (3) examples of the types of analyses that are possible with the data collected using this system, and (4) concluding observations.

LEGISLATION

In 1980, the Congress passed the Stevenson-Wydler Technology Innovation Act (Public Law 96-480) and amended it in 1986 with the Federal Technology Transfer Act (Public Law 99-502). This legislation was passed, in part, to (1) establish a technology transfer mission for federal agencies and their research and

development laboratories, (2) improve the use of federally funded research and technology by, among others, state and local governments, and the private sector, (3) provide federal employee recognition for outstanding contributions to technology transfer, and (4) ensure the full use of the products of the federal investment in research and development. The act also mandated the establishment of offices of research and technology applications (ORTAs) within major federal laboratories and required the set-aside for technology transfer of not less than 0.5 percent of each agency's research and development budget.

In addition, the Federal Technology Transfer Act, as implemented by Executive Order 12591, directs department and agency heads to authorize their government-owned, government-operated laboratories to enter into cooperative research and development agreements (CRDAs) with state and local governments, universities, and private companies; award exclusive licenses for patents to cooperators with federal laboratories; grant awards to federal employees significantly contributing to technology transfer; and implement royalty sharing programs. The act also institutionalizes the Federal Laboratory Consortium for Technology Transfer (FLC) and requires agencies to contribute to its funding.

The Congress, in general, and the House Committee on Science, Space, and Technology, in particular, have an understandable interest in determining whether the act as amended is producing the intended results and whether new legislative initiatives are called for to further enhance the technology transfer process. My

testimony is directed toward satisfying these needs.

In June 1988, the House Committee on Science, Space, and Technology asked GAO to examine the implementation of the Federal Technology Transfer Act of 1986. In response to that request, we reported that

> "We believe it is too early to determine the impact the act has had on technology transfer. Further, although agencies reported undertaking numerous technology transfer activities, the activities are defined differently and, consequently, uniform statistical information has not been available to make a comprehensive evaluation. To resolve this problem and facilitate evaluating the impact of the act on technology transfer, we are conducting a separate review to develop criteria for reporting technology transfer activities." (Implementation Status of the Federal Technology Transfer Act of 1986, GAO/RCED-89-154, May 1989, p.2).

Congressman Roe, Chairman of the House Science, Space, and Technology Committee, indicated that he believes it to be of paramount importance to have at hand valid data by which to judge agency implementation and the effect of the Federal Technology Transfer Act. In September 1988, the House Science, Space and Technology Committee asked us to develop criteria and standards for obtaining comparable data on technology transfer activities of federal agencies and their laboratories.

In response to the Committee's request, we took the following steps. First, we developed a data collection system designed to collect comparable data across agencies and their laboratories relating to their implementation of the act and its effects; and,

second, we demonstrated the feasibility of using the system by attempting to collect data from 27 federal agencies and 338 of their laboratories.

OUR APPROACH

We based the development of our data collection system on a review and analysis of (1) technology transfer legislation and literature, (2) agency and laboratory reports to the Office of Management and Budget and the Congress, and (3) interviews with department, agency, and laboratory officials. The analysis and synthesis of this information resulted in the development of a framework for data collection that was intended to provide the Congress as well as the executive branch with data for use in assessing the implementation and the effect of the Federal Technology Transfer Act.

This framework formed the structure from which we established data needs. Identified data needs in turn guided our development of two questionnaires for data collection. We pretested the two questionnaires, one for laboratories and one for agencies, during April and May 1989. We then revised the questionnaires on the basis of the pretest findings.

In June 1989, the House Committee on Science, Space, and Technology asked us to pilot test our data collection system. We

sent advance copies of the questionnaire to designated agencies and their laboratories to familiarize them with the questionnaires and to solicit their comments for improvements. In November 1989, we mailed revised questionnaires to 25 agencies within federal departments, 2 independent agencies, and 338 of their laboratories. Our sample included cabinet-level departments and federal independent agencies that conduct or fund research, development, or engineering. This group was composed of the departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Interior, Transportation, and Veterans Affairs, as well as the National Aeronautic and Space Administration and the Environmental Protection Agency. As of April 27, 1990, questionnaires were received from 21 (77.8 percent) of the 27 federal departments and independent agencies and 302 (89.3 percent) of the 338 laboratories. Appendix I lists the agencies and laboratories that have returned their questionnaires.

We expect the eventual return of almost 100 percent of the questionnaires. However, it will probably be another 2 months before all responses are received. Despite the incomplete data at hand, we carried out some preliminary analyses and formulated some tentative conclusions, which we will share with you today. Please keep in mind that the conclusions are tentative and that a final report based on the full data set and a more thorough analysis will be produced later.

PRELIMINARY FINDINGS

On the basis of our experience and analysis to date, it appears that we have been successful in developing a data collection system that should provide the Congress as well as the administration with reasonably sound and fairly extensive data across federal agencies and their laboratories. Further, we have also been successful in demonstrating that the system can be implemented on a national basis and that it appears to provide much more comparable and representative data relating to federal agency and laboratory implementation of the Federal Technology Transfer Act than available before. Finally, when fully analyzed, these data should provide a baseline for assessing improvements in Federal Technology Transfer Act implementation.

The following preliminary results of an analysis of partial questionnaire returns is presented to provide the Subcommittee with an illustration of the richness of the data collected in our demonstration of the viability of our data collection system. These results also provide the Subcommittee with some preliminary insights regarding federal agency and laboratory implementation of the act, as well as early data on some of the act's apparent effects. Our results are discussed in terms of the characteristics of the agencies and laboratories responding to our questionnaire, their implementation of various provisions of the act, and measures of effect.

Our analyses reflect 196 laboratory questionnaires that had been entered into our data base as of April 27, 1990. This represents about 58 percent of all laboratories to which we sent questionnaires. Another 106 laboratory-level questionnaires are being entered into our data base. Thirty-six laboratories and six agencies have not yet returned their questionnaires to GAO.

Implementation

An initial indicator of whether federal agencies have encouraged their laboratories to implement the major provisions of the Federal Technology Transfer Act is to consider the answers that laboratories provided to the following questions posed in our survey instrument.

To begin with, we asked the following question

Question 8: Has your laboratory received final written instructions from your agency for implementing any or all parts of the Federal Technology Transfer Act of 1986?

1. Yes. Final instructions were received. (110)
2. No. However, draft instructions were received. (29)
3. No instructions have been received. (48)

The numbers in parentheses represent the number of laboratories that responded to question 8. This question was answered by 187 of the 196 laboratories in our analysis. As

indicated by the numbers above, 3 years after the Federal Technology Transfer Act was signed into law, about 26 percent of the laboratories still report not having received any instructions from their agencies.

A second indication of agency and laboratory responsiveness to the objectives of the act are the responses to our question about the location of the mandated Office of Research and Technology Application. The act states that each federal laboratory shall establish an Office of Research and Technology Applications. The primary function of an ORTA is to disseminate information on federally owned or originated products, processes, and services having potential for transfer and to assist in linking the research and development resources of the federal laboratories to state and local governments and to the private sector. ORTAs are intended to serve as the bridge from laboratories to the outside. If the ORTAs are to be effective, then, they need to be close to laboratories. The question we posed was

Question 43: What is the location of the ORTA, or office that functions as an ORTA, that your laboratory manages or controls?
1. Within your laboratory. (37)
2. At agency headquarters. (128)
3. Other. (16)

Based on the data collected to date, the numbers in parentheses indicate that only about 20 percent of ORTAs are located in laboratories. Rather, they are located mainly at

agency headquarters. This is something we believe should be carefully considered. If the successful transfer of technology requires close and frequent contact among the players, then the ORTAs need to be close to the laboratories.

The Federal Technology Transfer Act authorizes agencies and their laboratories to develop cooperative research and development agreements (CRDAs) with state and local governments, universities, and private industry to facilitate the transfer of technology from federal laboratories to those units. One purpose of the act was to facilitate technology transfer at the grass roots or laboratory level. The act therefore allows departments and agencies to delegate authority to enter into CRDAs to their laboratories. Question 19 in our laboratory questionnaire reads as follows:

Question 19: Has your laboratory received authorization from your agency for approving CRDAs?
1. Yes. (71)
2. No. (109)

Of the 180 laboratories that answered this question, about 61 percent have not received authorization for entering into CRDAs on behalf of their agency.

If we now move on to another aspect of implementation, we note that the Federal Technology Transfer Act is explicit in requiring each agency with annual research and development (R&D) expenditures of more than $50 million to establish an awards program for its

scientific and technical personnel who have made contributions to technology transfer activities. Of the 21 agencies that have responded to our agency questionnaire, each had an R&D budget of more than $50 million in fiscal year 1989. However, not even half of these agencies had implemented a technology transfer awards program.

However, we collected information that indicates that some laboratories appear to have established their own awards programs, irrespective of whether their agencies had a program. Specifically, question 9 of our laboratory survey instrument reads as follows:

> Question 9: Does your laboratory give an award (separate and distinct from any such awards given by your agency) to reward scientific, engineering, and technical personnel for activities leading to the filing of patent applications or the award of patents?
> 1. Yes. (41)
> 2. No, but plan to begin giving such awards. (22)
> 3. No, and do not plan to. (128)

Of the 191 laboratories responding to date, it is apparent that, while many laboratories neither have nor plan to have such a program, 41 (or about 22 percent) currently give awards for filing and receiving patents--one notable technology transfer activity.

Also dealing with implementation is question 92, which asks the following:

> Question 92: Regarding promotions of your scientific, technical, and management personnel, does your laboratory have any guidelines that specifically recognize technology transfer activities or accomplishments as one factor on which promotion decisions may depend?
> 1. Yes. (41)
> 2. No. (145)

Note that this question does not assume that technology transfer activities and accomplishments are the single factor on which promotions rest; it asks only if there are guidelines for establishing these activities as one factor. Of the 186 laboratories that chose to answer this question, 78 percent said "No."

Effects

It is too early yet to assess the effect of the act on the actual transfer of research and development from federal laboratories to various other sectors of our society. However, we developed several questions designed to compare selected measures of effect at two times--in 1986, when the Federal Technology Transfer Act was enacted, and in 1989. Our measures are indirect indicators of underlying technology transfer processes. One such variable is the number of patents issued to federal laboratories or their personnel. As mentioned earlier, some provisions of the act were designed to stimulate and reward inventive creativity.

Question 69 and part four of Question 68 of our laboratory-level survey instrument ask:

Question 69: During FY 1986, how many patents were issued for inventions arising from your laboratory research or development work?
_____Number of patents issued from your laboratory during FY 1986. (317)

Question 68: During FY 1989, please indicate the following:
_____Number of patents issued from your laboratory for inventions arising from your laboratory research or development work. (314)

The lack of increase in the number of patents issued in 1986 and 1989, specifically 314 and 317, is disappointing. In effect, there has been no change. However, the time elapsed between 1986 and 1989 may simply be too short to reflect the real effects of a changed environment for patenting.

Another part of Question 68 asks about the number of patents pending for innovations arising from laboratory research or development work. We found that many laboratories that had not reported patents granted in 1989 actually had patents pending in that year. Unfortunately, data are not available concerning patents pending in 1986. Information of that sort was not maintained by the laboratories, so we could not make a relevant comparison between patents pending in 1986 and patents pending in 1989.

At present, however, it is too soon to say much about the act's effects, so there is a need be very careful about drawing conclusions from the data. Since our own data collection is incomplete, we really have no basis yet to say whether the number of patents issued is likely to increase as a result of the act.

The legislation also encourages federal laboratories to enter into licensing arrangements. We assessed responses to this provision by comparing the number of exclusive licenses granted in 1986 with the number granted in 1989. Here we found 8 cases in which the number of exclusive licenses granted in 1989 was less than the number granted in 1986; 11 cases in which there was an opposite result; and 136 cases where there was no difference in the number of exclusive licenses in 1986 and 1989 (most of these were cases in which no exclusive licenses were granted in either year).

We also made a comparison between 1986 and 1989 with respect to nonexclusive licenses. The results were similar to those described above, with no change in most cases from 1986 to 1989 and with most responses showing no nonexclusive licenses granted in either year.

However, the picture is very different when royalty income rather than patents and licensing agreements is considered.

Question 63 of our laboratory-level survey instrument asks, among other things, the following:

> Question 63: In FY 1986 and 1989, what amount of royalty income did your laboratory receive (1) from your agency and (2) directly from licensees for laboratory developed innovations?
> _____FY 1986 total royalty income received directly from licensees. ($176,000)
> _____FY 1989 total royalty income received directly from licensees. ($1,683,200)

Thus, the data show that with about $1.7 million in 1989, laboratories were clearly outperforming their 1986 "selves" when only $176,000 were received. The increase in royalties from 1986 to 1989 represents a tenfold increase. What is notable is that this increase, which is clearly important even though it is measured in current dollars, came about during a period in which the number of patents issued and the number of licensing agreements remained constant. When we have received all our data and have completed our analysis, we hope to shed more light on this issue.

The framers of the act were also concerned about the overall coordination of technology transfer nationwide--across all federal laboratories. It was for this reason that the legislation gave the Federal Laboratory Consortium a statutory charter. The organization that was formally chartered by the Federal Technology Transfer Act was actually organized in 1974. All major federal laboratories and centers, and their parent agencies, are automatically eligible for membership in FLC. The mission of FLC

is to promote the rapid movement of federal facility research results and technologies into the mainstream of the U.S. economy.

In Question 75, we asked this:

Question 75: Does your laboratory have a representative to the Federal Laboratory Consortium (FLC)?
1. Yes. (34)
2. No. (154)

Thus, our preliminary findings here are that most laboratories (82 percent) do not have a representative to FLC. In addition, responses to some other questions make it clear that many laboratories do not draw upon the services FLC provides (for example, FLC's electronic mail system and its Clearinghouse data base).

CONCLUDING OBSERVATIONS

Although the United States has been and continues to be very strong in fundamental scientific work, our output of applied research and development is another matter, whether measured in terms of patents, technological balance of payments, or the balance of trade in high-technology goods.

The challenge that the United States must face is to turn its strength in fundamental science into marketable products and services that are competitive worldwide. This is what the

transfer of technology is all about--but we must carry out this complex transfer process without impairing our capacity to do fundamental research and development.

To know whether innovative ideas that have commercial potential actually get to market requires an adequate framework and system for reporting. As stated in the Stevenson-Wydler Technology Innovation Act of 1980, "Technology and industrial innovation are central to the economic, environmental and social well-being of citizens of the United States" because they offer

-- an improved standard of living in the United States,

-- increased public and private-sector productivity,

-- new industries and employment opportunities,

-- improved public services, and

-- enhanced U.S. competitiveness in the world market.

If we are to assess whether the technology transfer legislation can, once fully implemented, help achieve these things, then what is called for is a viable system for collecting, synthesizing, managing, and reporting information on technology transfer activities.

It is important to note that our primary assignment was to develop and refine criteria and standards for reporting and to demonstrate the viability of the reporting instrument that we designed. We are pleased to be able to report that we have demonstrated this instrument to be viable. The cooperation we received, our response rate, and the preliminary data we describe are testimony to that fact. The Congress now has the only comprehensive data base existing on federal technology transfer organizations and operations. We owe our success to the serious commitment of federal laboratory scientists to technology transfer.

Although our initial findings are based upon a preliminary analysis of incomplete data, they suggest that, nationally, agency and laboratory implementation of the Stevenson-Wydler Technology Innovation Act of 1980 as amended by the Federal Technology Transfer Act of 1986 leaves room for improvement. Laboratories seem to require more guidance from agencies regarding the implementation of the amended act, direction to establish ORTAS at the laboratory level and to negotiate CRDAs, and encouragement to consider technology transfer activities important, rewarding, and salient in the consideration of laboratory staff promotions and awards. Further, agencies do not appear to be encouraging increased participation by laboratories in FLC. In sum, preliminary and incomplete data do suggest that agency and laboratory implementation of and responsiveness to provisions of

the amended act need improvement.

Mr. Chairman, this concludes my remarks. I would be happy to answer any questions you or the Subcommittee may have.

Questionnaires
Sent and Returned as of April 27, 1990

Organization	Laboratory-level No. Sent	Laboratory-level No. Returned	Agency-level Returned
Departments			
Agriculture			
Agricultural Research Service	54	49	Yes
Forest Service	12	11	Yes
Commerce			
National Institute of Standards and Technology	4	4	Yes
National Oceanic and Atmospheric Administration	22	22	Yes
National Telecommunications and Information Administration	1	1	No
Defense			
Army	42	41	No
Air Force	14	14	Yes
Navy	19	14	Yes
Energy			
Conservation & Renewable Energy	1	1	Yes
Defense Programs	4	4	Yes
Energy Research	11	10	Yes
Fossil Energy	2	2	No
Health and Human Services			
Alcohol, Drug Abuse and Mental Health Administration	3	3	Yes
Centers for Disease Control	3	3	Yes
Food and Drug Administration	6	6	Yes
National Institutes of Health	13	12	Yes
Interior			
Bureau of Land Management	1	0	Yes
Bureau of Mines	9	8	No
Bureau of Reclamation	1	1	Yes
U.S. Geological Survey	11	8	Yes
Fish and Wildlife Service	13	13	Yes

APPENDIX I

Organization	Laboratory-level No. Sent	Laboratory-level No. Returned	Agency-level Returned
Transportation			
Coast Guard	1	1	No
Federal Aviation Administration	1	1	Yes
Federal Highway Administration	1	1	No
Veterans Affairs			
Veterans Administration Medical Centers	65	50	Yes
Independent			
National Aeronautic and Space Administration	9	9	Yes
Environmental Protection Agency	15	13	Yes
Totals	338	302 (89.3%)	21 (78.8%)

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Excess and Surplus Personal Property
Transfer Program

Statement of
Johnny C. Finch, Director
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General Government Division

Before the
Subcommittee on Government
Activities and Transportation
Committee on Government Operations
United States House of Representatives

Madam Chairwoman and Members of the Subcommittee:

We welcome this opportunity to appear before you today to provide our observations on the program for transfer of excess personal property to nonfederal organizations and donation of surplus personal property through the State Agencies for Surplus Property (State Agencies) to nonfederal recipients.

As you mentioned in your letter of invitation, we have had lengthy experience with this program. Public Law 94-519, enacted in 1976, required us to report biennially to Congress on several aspects of the program, including (1) a full and independent evaluation of its operation and (2) an assessment of the extent to which the objectives of the public law have been fulfilled. We issued four such biennial reports: the first in 1980, the most recent in 1988.[1]

Our reports show a consistent trend that the basic objectives of Public Law 94-519 have been met. First, the law resulted in reducing the proportion of total excess property that was being transferred to nonfederal organizations, with more being used by federal agencies. In 1976, federal agencies were provided with $881 million in excess property (at original acquisition cost)

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[1]Property Management: Excess and Surplus Personal Property Transfers to Nonfederal Organizations (GAO/GGD-88-68, May 13, 1988).

for their own use, but the agencies transferred $243.1 million in property to nonfederal organizations. Nonfederal organizations thus received about 22 percent of available excess property. In 1985 the federal agencies were provided with $629.9 million in excess property, but nonfederal organizations received much less--$53.6 million. Their share of the distribution at the excess stage was reduced to less than 8 percent.

Second, surplus property donated through State Agencies to eligible donees was being used for a wider range of purposes. The Public Law added three new purposes for which property can be donated through State Agencies: conservation, economic development, and parks and recreation. In fiscal year 1985, $35.6 million in personal property was donated for these purposes.

While concluding in our 1988 report that the law's basic objectives were being met, we also discussed some concerns about the future health and viability of the State Agencies. First, our analysis of 48 external audits and 51 GSA regional reviews of State Agencies conducted between July 1, 1983, and September 30, 1985, showed that 25 percent or more of the State Agencies reviewed had problems in at least 1 of 5 functional areas GSA considers to be important indicators of program management. Property and inventory control problems were by far the most pervasive. State Agencies also had problems with the adequacy of

their fiscal accounting systems, eligibility of donee organizations, performance of compliance and utilization reviews, and failure to correct problems identified in prior audits and reviews. We recommended that GSA increase coverage and follow-up of these areas in its biennial regional review process. GSA agreed.

Second, we found that State Agencies had donated disproportionate--but not necessarily inappropriate--amounts of surplus property to their largest recipients. The 44 State Agencies who responded to this question on our questionnaire estimated that they had 29,800 recipients in their States in fiscal year 1985. Our analysis of the questionnaire responses indicated that the 10 largest recipients in these States--440 recipients in all--received 35 percent of the total amount donated by these State Agencies. Our analysis also disclosed an apparent relationship between State Agency efforts to promote the program and the distribution pattern: the greater the promotional effort, the greater the dispersion of property. We recommended that GSA encourage the State Agency directors to aggressively promote the benefits of the donation program within their states and advertise the variety of property available through the donation program. GSA agreed, citing several actions it planned to take.

Third, we noted that the amount of surplus property donated through State Agencies to eligible recipients in fiscal year 1985 had declined by about 14 percent from the previous year. Through analysis of questionnaire data submitted by State Agencies we concluded that the financial solvency of some of the State Agencies that depend on service charges to fund their operations had been eroded. We found that during fiscal years 1983 to 1985, between 30 and 36 of the 55 State Agencies had operating losses each year. We recommended that GSA, as a part of its biennial regional reviews, collect a variety of information on State Agencies' financial condition and that GSA use this information to identify and possibly provide assistance to help them resolve their operational problems. GSA agreed.

One possible contributing factor affecting the financial health of State Agencies is the amount of excess property that federal agencies make available to nonfederal organizations, and therefore unavailable to the State Agencies for donation. These nonfederal organizations are eligible to receive excess property under exemptions in Public Law 94-519. The most significant nonfederal recipients of excess property at the time of our report were grantees and the Department of Agriculture's Cooperative Forest Fire Control Program and a Cooperative Extension Service program. As we noted earlier, the amount of property these nonfederal organizations received in fiscal year

1985 was valued at $53.6 million. This was about 20 percent of the total donated by all State Agencies.

As you know, the Federal Property Management Improvement Act of 1988 changed our role in relation to this program, a change we fully supported. Next spring we are to receive a copy of the Administrator of General Services' report on the program for the period ending September 30, 1990. Drawing on our earlier work, we will review and evaluate the Administrator's report and, if appropriate, make comments and recommendations to Congress.

This approach will permit us to better use our scarce resources by targeting them on current issues. And, in fact, we are presently beginning work on two specific situations involving excess property: the Humanitarian Assistance Program and possible use of such property by the homeless.

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Madam Chairwoman, that concludes my prepared remarks. I would be pleased to respond to questions.