United States General Accounting Office

GAO

Report to Congressional Committees

October 2002

INTELLECTUAL PROPERTY

Federal Agency Efforts in Transferring and Reporting New Technology

GAO-03-47

Contents

Tables

Figures

Abbreviations

ARS	Agricultural Research Service
CRADA	cooperative research and development agreement
DOD	Department of Defense
DOE	Department of Energy
GAO	General Accounting Office
NASA	National Aeronautics and Space Administration
NIH	National Institutes of Health
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
OMB	Office of Management and Budget
OTT	Office of Technology Transfer
TTCA	Technology Transfer Commercialization Act of 2000
USGS	United States Geological Survey
USPTO	United States Patent and Trademark Office

GAO
Accountability * Integrity * Reliability

United States General Accounting Office
Washington, DC 20548

October 31, 2002

Congressional Committees

The federal government is a primary sponsor of research conducted in the United States, expending during fiscal year 2001 $19.4 billion for research performed by federal employees and $62.2 billion for research conducted under contracts and grants. Some of this research leads to the development of technology that can be patented, licensed, and made available to the public through the introduction of new products and processes. In the past, however, there have been concerns that new technologies developed under federal research projects were not being properly translated into practical use. In response, the Congress has made attempts through legislation over the past 2 decades to ensure that federally sponsored inventions were being transferred to the private sector where they could be commercialized.

In 1980, the Congress passed two landmark pieces of legislation—the Stevenson-Wydler Technology Innovation Act of 1980 and the Bayh-Dole Act—with the intent of promoting economic development, enhancing U.S. competitiveness, and benefiting the public by encouraging the commercialization of technologies developed with federal funding. These acts generally have been considered a success, because the federal agencies and their funding recipients now can profit from their inventions and thus have a greater incentive to produce new technology. In addition, the technology created is more likely to be made available to those who can use it.

Although the acts have common objectives, the Stevenson-Wydler Act focuses on inventions owned by the federal government, while the Bayh-Dole Act focuses on inventions created under federal contracts, grants, and cooperative research and development agreements. Under the Stevenson-Wydler Act, inventions owned by the government remain the property of the agencies that produced them. However, the act as amended sets out guidelines and priorities that encourage commercialization of these inventions through the licensing of technology to U.S. business. Under the Bayh-Dole Act, inventions created under contracts and grants normally become the property of the contractors and grantees, provided they follow certain reporting and other requirements. Among these requirements are notifying the funding agency that (1) the invention has been created, (2) the contractor or grantee has elected to

retain ownership, (3) a patent application has been submitted, and (4) the government has a royalty-free right to use the invention.

More recently, the Congress passed the Technology Transfer Commercialization Act of 2000 in an attempt to improve the ability of federal agencies to license inventions created in federal facilities. Among other things, the act requires federal agencies with laboratories and technology transfer functions to provide the Office of Management and Budget (OMB) with reports on their technology transfer programs. The act also provides for the information to be submitted with the agencies' annual budget requests, beginning with the budget for fiscal year 2003. The agency reports would include information on operations and plans as well as statistics on patenting and licensing activities. In addition, the act requires the Department of Commerce to summarize these data into an annual, government-wide report to the Congress and others.[1]

As you know, both the Bayh-Dole Act and the Technology Transfer Commercialization Act of 2000 contain requirements that GAO issue a report on the implementation of the acts at least once every 5 years. As agreed with your offices, the primary objective of our current report was to provide information on how federal agencies had identified, patented, and licensed inventions created in their own facilities during fiscal years 1997-2001. We also agreed that we would determine (1) the extent to which the agencies complied with the Technology Transfer Commercialization Act of 2000 requirement to submit reports on their technology transfer activities to OMB and the Department of Commerce at the time they submit their fiscal year 2003 budget requests and (2) what the agencies have done—since the issuance of our 1999 report on the issue—to improve compliance with reporting requirements under the Bayh-Dole Act for inventions created under contracts and grants.

To obtain information on federal technology transfer programs and to determine the extent to which agencies complied with the reporting requirement of the Technology Transfer Commercialization Act of 2000, we analyzed the activities of the nine federal agencies that each had estimated internal research budgets of at least $500 million in fiscal year 2001. These agencies were the Agricultural Research Service (ARS) within the Department of Agriculture; the Department of the Air Force within the

[1]While we refer to the consolidated report as being the responsibility of the Department of Commerce, the act actually requires that the Secretary of Commerce issue the report.

Department of Defense (DOD); the Department of the Army within DOD; the Department of Energy (DOE); the National Aeronautics and Space Administration (NASA); the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce; the National Institutes of Health (NIH) within the Department of Health and Human Services; the Department of the Navy within DOD; and the U.S. Geological Survey (USGS) within the Department of the Interior. To determine what federal agencies had done to improve compliance with reporting requirements under the Bayh-Dole Act, we analyzed the activities of the five agencies that were included in our 1999 report on this issue. That report noted that contractors and grantees were not always complying with such provisions as reporting new inventions, confirming that federal agencies had royalty-free licenses to such inventions, or recording on patent applications that the new technologies were the result of federal funding.[2] The agencies included in this segment of our work were DOD, DOE, NASA, NIH, and the National Science Foundation (NSF). Additional details on our scope and methodology are included in appendix I. Other appendices provide detailed information on the technology transfer activities of these nine agencies; these appendices are an integral portion of this report.

Results in Brief

Federal agencies are identifying, patenting, and licensing inventions created in their own facilities through technology transfer programs that vary in design, approach, and measurable output. With respect to design, some agencies have centralized technology transfer programs, while others have decentralized programs, and still others have components of both. From an approach standpoint, the agencies differ on what they will patent and the types of licensing arrangements they will enter. Perhaps the greatest diversity among the agencies is in their output, based on statistics provided to us by the nine federal agencies with internal research budgets of at least $500 million in fiscal year 2001. In total, these agencies reported 3,676 new inventions, 1,585 patents issued, and $74.5 million in licensing revenues during fiscal year 2001. Primarily because of its contractor-operated national laboratories, DOE had the most new inventions, patents applied for and received, and licenses executed, but was second by a wide margin in licensing income to NIH, which received $46.1 million during the

[2] U.S. General Accounting Office, *Technology Transfer: Reporting Requirements for Federally Sponsored Inventions Need Revision*, GAO/RCED-99-242 (Washington, D.C.: Aug. 12, 1999).

fiscal year. Agency officials cautioned against putting too much emphasis on statistics. They believed that, while output is an important measurement, it is not necessarily the best indicator of how successful an agency has been in creating and transferring technology. Rather, in their view output must be considered in the context of the agency's mission, the type of research it conducts, the commercial potential of the inventions produced, and the best method for disseminating the products and research to those who can use them.

Federal agencies did not fully comply with the requirement of the Technology Transfer Commercialization Act of 2000 that they submit reports on their technology transfer activities to the Office of Management and Budget and the Department of Commerce as a part of their fiscal year 2003 budget requests. For its part, the Department of Commerce issued guidelines that established a timeline and format for the agencies to follow in developing their reports. However, only one of the nine agencies we reviewed submitted its report on time and, while all the agencies eventually submitted reports, the reports in some cases were incomplete, contained statistics that were inconsistent or inaccurate, and differed in the data elements used to compile certain statistics. Although submissions by the agencies were too late to be considered for the President's budget for fiscal year 2003 submitted to the Congress in February 2002, at that time the Office of Management and Budget did not have procedures to ensure that agencies transmit the information for consideration in the budgeting process. Furthermore, the Department of Commerce was delayed in preparing its own report to the Congress on technology transfer activities nationwide as required by the act. In general, the reporting problems appear to be largely attributable to the confusion associated with the first year of the act's implementation and agency officials believe reporting should improve in the future. To improve the consistency and utilization of the reports, we are recommending that (1) the Department of Commerce revise its guidelines to clarify the data elements that are to be included in the agencies' reports and (2) the Office of Management and Budget develop procedures for accumulating the information submitted by the agencies under the Technology Transfer Commercialization Act of 2000 for consideration in the development of the budget.

While four of the five agencies reviewed for our 1999 report have taken some steps to improve contractor and grantee compliance with reporting requirements under the Bayh-Dole Act, these efforts have not addressed underlying problems—such as duplication in reporting requirements—we noted in that report. NIH said that it has made additional efforts to educate its contractors and grantees on the importance and mechanics of reporting

technology transfer activities and was redesigning its monitoring system. DOD said it has not taken agencywide action but that various units have taken such steps as adopting a new monitoring system and putting an increased emphasis on reviewing documentation submitted at the end of research projects to identify unreported inventions. DOE said it has implemented a new centralized monitoring system that has reduced its backlog in recording with the U.S. Patent and Trademark Office certain invention notifications submitted to DOE by its contractors and grantees. NASA said it has implemented a new invention reporting system and integrated this system with an existing database and tracking system. NSF said it has made no changes. Agency officials said that they had not been able to standardize, improve, and streamline the reporting process itself because, as we noted in the 1999 report, this would require congressional action.

We provided a copy of our draft report to the Department of Commerce and the Office of Management and Budget for review and comment. The Department of Commerce, in written comments, stated that the draft report was "useful" and provided a realistic analysis of the first cycle of the new reporting process under the Technology Transfer Commercialization Act of 2000. The Department of Commerce also stated that our recommendations were reasonable and that their adoption would improve reporting during the next cycle. The Office of Management and Budget, in oral comments, said that the overall thrust of our recommendation that the Office develop procedures for accumulating and considering agency information, as part of the annual budget process, was reasonable. The Office added that as a result of the information presented in the draft report, it would consider incorporating guidance on reporting on technology transfer activities into Circular A-11, which provides agencies with instructions on preparation and submission of budget materials to the Office. Both agencies also provided some technical clarifications that we incorporated as appropriate.

Background

Prior to 1980, federal agencies generally retained title to any inventions created under federal research—whether it was conducted by contractors and grantees or by the agencies in their own facilities—although specific policies varied among the agencies. Increasingly, this situation was a source of dissatisfaction, as there was a general belief that the results of federally owned research were not being made available to those who could use them. There were also concerns that technological advances attributable to university-based research funded by the government were not being utilized because the universities had little incentive to seek uses

for inventions to which the government held title. Additionally, the complexity of the rules and regulations and the lack of a uniform policy for these inventions often frustrated those who did seek to use the research.

In 1980, the Congress addressed these concerns with two landmark pieces of legislation that changed the direction of federal technology transfer.[3] One was the Stevenson-Wydler Technology Innovation Act of 1980, which addressed technology transfer of government-owned inventions primarily created in federal laboratories.[4] The second was the Bayh-Dole Act, which primarily addressed ownership of technology created under federal contracts, grants, and cooperative agreements.[5]

The Stevenson-Wydler Act articulated a broad role for government in promoting commercial innovation and established the first major initiative to proactively transfer technology from federal laboratories to industry. The act made technology transfer an explicit mission of the federal laboratories by, among other things, requiring the establishment of an office in each laboratory to identify technologies with commercial potential and to transfer that knowledge to U.S. industry. The Stevenson-Wydler Act was amended by the Federal Technology Transfer Act of 1986, which empowered the directors of government-owned laboratories to enter into cooperative research and development agreements (CRADA) and to negotiate licensing agreements for inventions created in the laboratories.[6] The scope of the act was affected as well by the Technology Transfer Commercialization Act of 2000, as discussed below.

The primary purpose of the Bayh-Dole Act was to allow universities, not-for-profit corporations, and small businesses to patent and commercialize their federally funded inventions. While contractors and grantees would retain title to their inventions, the government would

[3] Technology transfer has been defined as "the sharing of technology or technical knowledge across different organizations" and commonly refers to that process where one party enters into a licensing arrangement with another party to confer the right to exploit commercially a patented or otherwise proprietary technology.

[4] P.L. 96-480, Oct. 21, 1980.

[5] P.L. 96-517, Dec. 12, 1980.

[6] P.L. 99-502, Oct. 20, 1986.

retain a nonexclusive, nontransferable, irrevocable, paid-up (royalty-free) license to use it. The contractors and grantees would have to conform to certain reporting requirements in the Bayh-Dole Act as well as seek patent protection and attempt commercialization. Additionally, the Bayh-Dole Act authorized federal agencies to obtain, protect, and license the government's interest in patents on federally owned inventions, thus empowering the agencies to implement the policy defined in the Stevenson-Wydler Act. In doing so, restrictions were imposed on how the government could license its patents, thereby limiting the government's options under both acts. The Bayh-Dole Act also included a requirement that GAO study and issue periodic reports on the implementation of the act.[7]

The Bayh-Dole Act does not protect the patent interests of large, for-profit businesses engaged in government research. In 1983, however, President Reagan issued a memorandum to the heads of executive branch agencies advising them that, to the extent permitted by law, it would be the policy of his administration to apply the patent policy of the Bayh-Dole Act to any invention made in the performance of federally funded research and development contracts, grants, and cooperative agreements without regard to the size of the recipient's business or its nonprofit status. On April 10, 1987, the President issued Executive Order 12591, which, among other things, requires executive agencies to promote commercialization in accordance with the 1983 memorandum. In meeting our responsibility to study and issue reports under the Bayh-Dole Act, we have included implementation of the executive order as well.

The Congress has passed additional legislation over the years to amend the Stevenson-Wydler and Bayh-Dole Acts and to enhance technology transfer by federal agencies. One such law was the Technology Transfer Commercialization Act of 2000 (TTCA), which was an attempt to make the technology transfer process for inventions created in federal laboratories more "industry friendly" as well as to simplify technology licensing.[8] In this regard, the Congress sought to remove existing procedural obstacles and uncertainty, particularly in the licensing of federally patented inventions

[7] Originally, GAO was to issue annual reports. However, in 1991, the act was amended to require a report at least every 5 years. Our last report in response to this mandate was *Technology Transfer: Administration of the Bayh-Dole Act by Research Universities*, GAO/RCED-98-126 (Washington, D.C.: May 7, 1998).

[8] P.L. 106-404, Nov. 1, 2000.

created in government-owned, government-operated research facilities. The act accomplished this by authorizing the licensing of government owned technology through CRADAs and by rewriting and streamlining the restrictions imposed on the government's licensing of government-owned inventions. The act clarified a number of provisions related to the notice required for exclusive and partially exclusive licenses, receipt and distribution of royalties, co-ownership of inventions with nonfederal co-inventors, and assignment of federal employee rights in inventions to the government.

The TTCA also amended the Stevenson-Wydler Act to require federal agencies to submit annual reports on their technology transfer activities to OMB as a part of the budget process. The provision applies to any agency that either (1) operates one or more federal laboratories or (2) applies for, obtains, or maintains patents or licenses or otherwise protects or transfers any technology in which the federal government has any right, title, or interest. Commerce officials say that, in effect, this requires reports by all agencies responsible for technology created in government facilities, regardless of whether these facilities are operated by the government or by contractors. Each agency is required to submit its report to OMB as a part of the agency's annual budget submission as well as to Commerce for the development of a government-wide report.[9]

The TTCA requires an agency's annual report to include the following:

- An explanation of the agency's technology transfer program for the preceding fiscal year and the plans the agency has for conducting its technology transfer function, including its plans "for securing intellectual property rights in laboratory innovations with commercial promise" and "for managing its intellectual property so as to advance the agency's mission and benefit the competitiveness of United States industry …"

- Information on technology transfer activities for the preceding fiscal year regarding:

    - The number of patent applications filed.

[9] The act also requires the agency to provide a copy of its report to the Attorney General; however, Commerce is supposed to develop the summary report from these submissions, with the Attorney General's consultation.

- The number of patents received.
- The number of fully-executed licenses that received royalty income, categorized by whether they were exclusive, partially exclusive, or non-exclusive, and the time elapsed from the date on which the license was requested by the licensee in writing to the date the license was executed.
- The total earned royalty income including such statistical information as the total earned royalty income, of the top 1 percent, 5 percent, and 20 percent of the licenses, the range of royalty income, and the median, except where disclosure of such information would reveal the amount of royalty income associated with an individual license or licensee.
- Disposition of earned income.
- The number of licenses terminated for cause.
- Additional "parameters or discussion the agency deems relevant or unique to its practice of technology transfer."

The TTCA did not include instructions to OMB regarding how OMB was to account for or report the data received from the agencies. However, the act did require the Secretary of Commerce, in conjunction with the Attorney General and the Commissioner of Patents and Trademarks, to issue an annual report to the Congress, the President, and the United States Trade Representative. Also, the act required GAO to study and report on the implementation of the TTCA as a part of its reporting mandate under the Bayh-Dole Act.

Federal Technology Transfer Programs Vary in Design, Approach, and Output

The nine federal agencies we reviewed have each established programs for identifying, patenting, and licensing inventions created in their own facilities.[10] However, these programs varied in design, approach, and output. For example, DOE and its contractor-operated laboratories led all agencies in the number of new inventions disclosed, patents applied for and received, and licenses executed during fiscal year 2001. However, NIH

[10] Intramural research is that research conducted in federal facilities by federal employees and is contrasted with extramural research, which is research conducted by federal contractors and grantees.

was by far the leader in licensing income. Agency officials cautioned against putting too much emphasis on output. They said that, while output is important, success must be considered in the context of an agency's mission, the type of research it conducts, the commercial potential of the inventions produced, and the best method for disseminating the fruits of its research to those who could use them.

Agencies Have Designed Programs Tailored to Their Individual Missions and Objectives

No single federal agency is responsible for managing technology transfer activities governmentwide. Rather, each federal agency involved in technology transfer designs its own program and can tailor this program to its specific mission and technology transfer objectives. In this regard, the nine agencies that, as shown in appendix II, obligated at least $500 million for intramural research during fiscal year 2001 had established programs that varied widely in their design, especially in size and the manner in which they were administered. This variation is illustrated in the following examples:

- NIH has a technology transfer function with both centralized and decentralized components. From a licensing standpoint, the activities are centralized, with a single office responsible for negotiating and administering all licenses. However, such activities as monitoring invention disclosures and determining when to seek a patent are largely decentralized, with the individual institutes and centers having their own technology transfer offices for this purpose. NIH also has a centralized reporting system for all of its technology transfer functions and can provide statistics on disclosures, patents, and licenses from this system.

- Each of the military services within DOD has its own technology transfer program and each of these is decentralized. While there is some variation among the services, patenting and licensing decisions are generally concentrated at the command or research unit level, as is recordkeeping. None of the services has a unified technology transfer database and, when statistics are needed, the services must query the individual commands or units for information.

- DOE has few inventions produced by federal employees in its own facilities. Instead, most DOE inventions come from national laboratories operated by DOE contractors, with the inventions becoming the property of the contractors and each contractor basically making its own decisions on patenting and licensing. In most cases, DOE must query the individual laboratories to obtain detailed statistics on technology transfer activities, although there are some centralized data on inventions created by DOE

employees or acquired by DOE when the contractor elected not to take title.

- At NASA, the individual NASA centers and laboratories separately report and account for the inventions created by their employees, but decisions on patenting are centralized within the Office of Patent Counsel. Similarly, licensing activities are centralized within the Office of Aerospace Technology. NASA has a centralized reporting system that is capable of providing statistical information on its technology transfer activities. Like DOE, NASA also has a large contractor-operated laboratory, the Jet Propulsion Laboratory. The contractor can retain title to, patent, and license the inventions it creates in this facility. If NASA needs to obtain statistical information, it must query the contractor.

- ARS is the principal research agency of USDA and has been delegated the authority to administer technology transfer activities for the entire department. All patenting and licensing activities are centralized within ARS' technology transfer office.

- USGS has a relatively small technology transfer function, befitting the small number of inventions the agency owns. The technology transfer program is in the midst of a major reorganization due in part to USGS' adoption of a decentralized integrated science approach. According to an agency official, patenting and licensing in the past have been handled by a central Technology Transfer Office. Since April 2002, the Department of Navy has been filing and prosecuting patent applications for USGS.

- At NOAA, which had the least number of new inventions, patents, and licenses among the nine agencies we queried, the technology transfer function is carried out by one person on a part-time basis. There is no formal tracking system for monitoring inventions, patents, and licenses.

Agencies Differ in Their Approaches to Patenting and Licensing Their Technologies

As with the design of their programs, the federal agencies we reviewed differ in the way they approach technology transfer in such areas as deciding what inventions to patent, and when to enter into exclusive licensing arrangements. In deciding whether to patent an invention, agency officials said they must weigh such diverse factors as the commercial potential of the product or process, the costs of obtaining a patent, and the best method for getting the product or process to those that can benefit from it.

NIH officials, for example, say they are selective when applying for patents because of the high costs of obtaining and maintaining them. Patenting decisions are made at the institute or center level and the institute or center will be expected to bear the associated costs. NIH officials said that the decision on whether to pursue a patent can involve many factors and that a patent is not always the best option. If the product is a biological material and has only a short productive life, NIH may license the product without obtaining patent protection. If the product does not have commercial potential but has some other value related to research or the public health, NIH may simply disseminate information through publication.

The military services say they often patent inventions for "defensive" purposes. In this regard, the primary concern is protecting their rights in inventions that may have a military use at some future date. At the same time, they acknowledge that many of their inventions have little commercial appeal because there may be limited use for them in civilian applications. Similarly, DOE officials say that they have relatively high patent activity because their laboratory contractors tend to want to retain title to their inventions and, to do so, must seek patents on them.

An ARS official said that, even though the technology they create may have significant value to researchers and the agricultural community, it may not have a broad commercial appeal that would make it attractive to potential licensees. ARS resolves this situation in many cases by publishing the information and disseminating it in such a way that it is put into the hands of those who can use it.

In licensing their technologies, federal agencies have the option of granting licenses that are exclusive, nonexclusive, or partially exclusive. Agency officials noted that they may not always have the choice of granting nonexclusive licenses because it is often difficult to find even one potential licensee willing to take the risks and assume the high costs of bringing a new product to market.

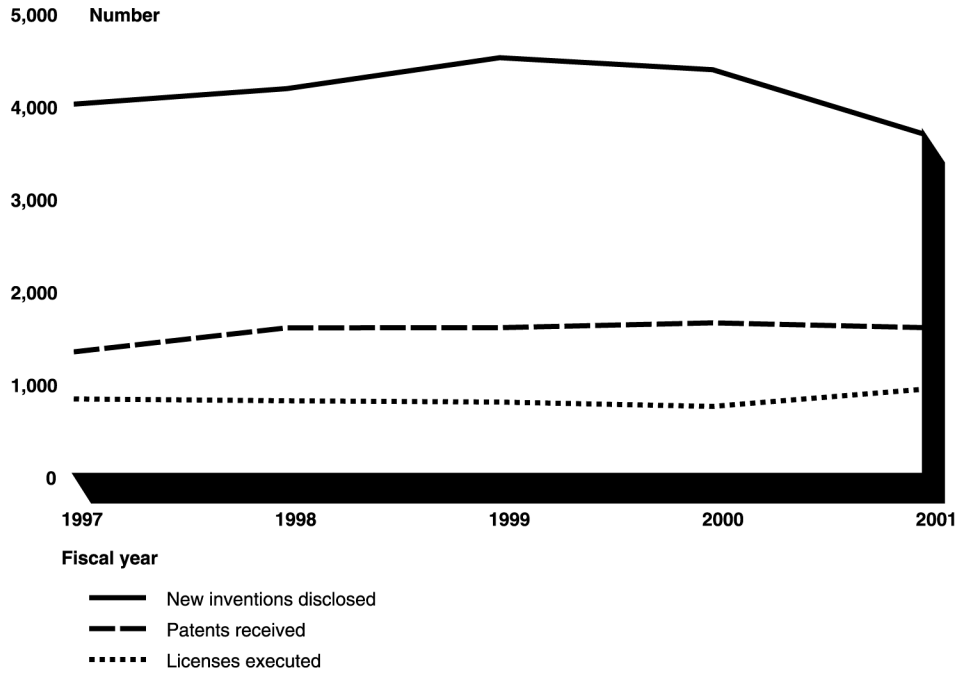
Agency Output Varies in Areas Such as New Inventions, Patents, Licensing, and Income

Because there is no central database on the technology transfer activities of all federal agencies, we could not obtain statistics on measurable output government-wide. Instead, we asked the nine agencies included in our review to provide output statistics in specified categories for fiscal years 1997 through 2001. These statistics are shown in appendix IV, with table 1 providing a comparison of all nine agencies for fiscal year 2001 and

tables 2 through 10 providing summaries of the individual agencies' statistics from fiscal year 1997 through fiscal year 2001.

As shown in figure 1, the nine agencies in total had relatively stable output in terms of new inventions disclosed, patents received, and licenses executed from fiscal year 1997 through fiscal year 2001. As shown in figure 2, however, licensing income generally increased over this same period.[11]

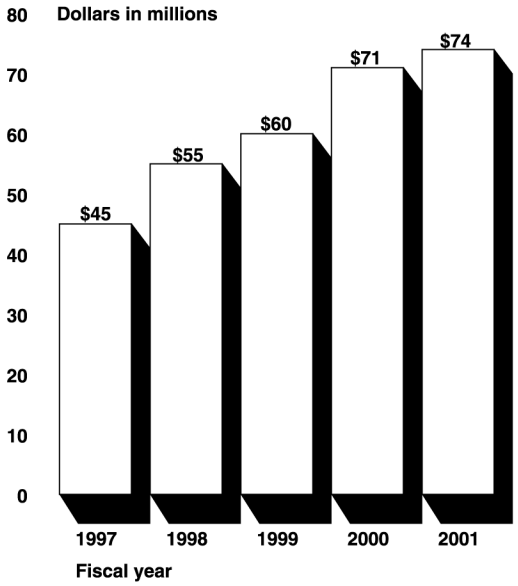
Figure 1: Invention Disclosures, Patents Received, and Licenses Executed by Nine Federal Agencies, Fiscal Years 1997 through 2001



Source: Statistics provided by ARS, Air Force, Army, DOE, NASA, NIH, NOAA, Navy, and USGS.

[11] The values shown on these and other figures and tables in this report are actual and have not been adjusted for inflation.

Figure 2: Total Royalty Income for Nine Federal Agencies, Fiscal Years 1997 through 2001



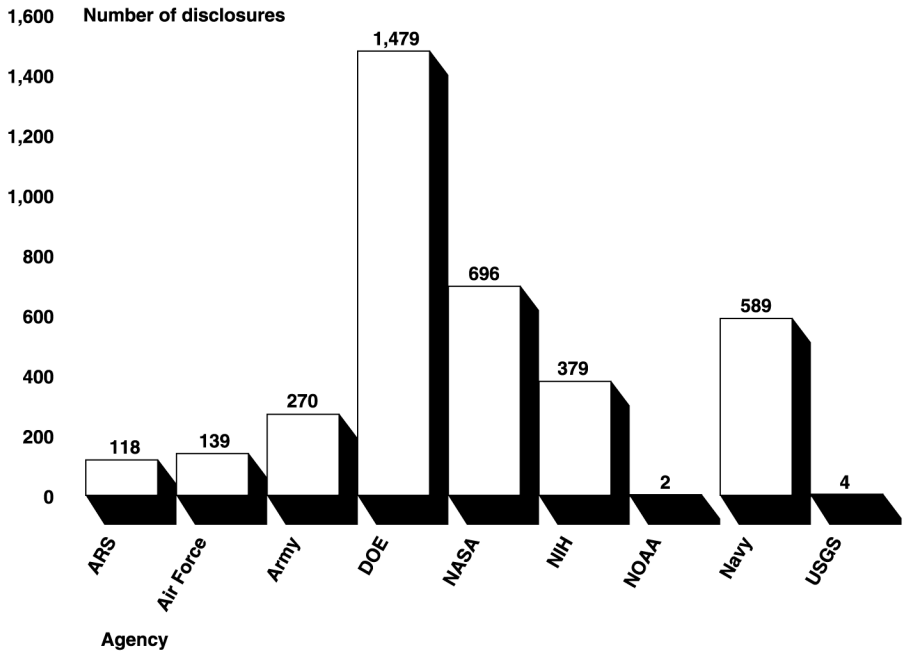
Source: Statistics provided by ARS, Air Force, Army, DOE, NASA, NIH, NOAA, Navy, and USGS.

For purposes of comparing output by individual agencies, the statistics for fiscal year 2001 are the most recent and comprehensive available. These statistics show that, while there are wide variations in individual output categories, the bulk of activity was usually concentrated in a few agencies. DOE was the leader in most of the categories for which we obtained statistics, with the most new inventions, patent applications, patents received, patents in force, licenses executed, licenses in force, and licenses producing income in fiscal year 2001. NIH, however, was by far the leader in licensing income. Similarly, NOAA and USGS, with small technology transfer programs, had the least measurable output in most categories.

Invention disclosures

Figure 3 compares inventions disclosed in fiscal year 2001 for all the agencies included in our review. DOE and NASA were the leaders in invention disclosures, with 1,479 and 696 respectively, or 59.2 percent of 3,676 disclosures by all nine agencies for the fiscal year.

Figure 3: Invention Disclosures for Nine Federal Agencies, Fiscal Year 2001

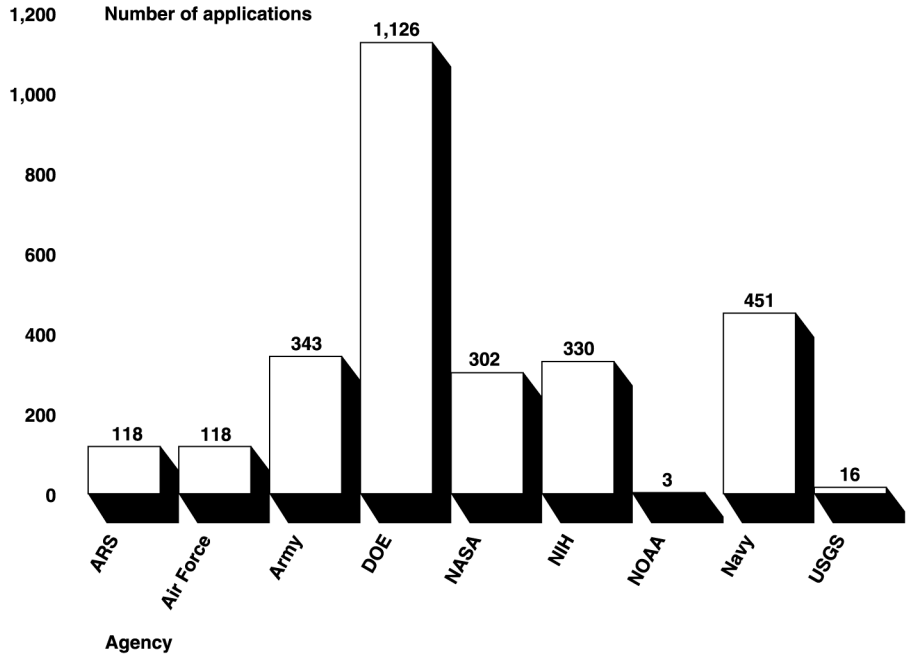


Source: Statistics provided by the agencies cited.

Patent applications

As shown in figure 4, DOE was also the leader in patent applications in fiscal year 2001, with 1,126 applications. These represented 40.1 percent of the total number of applications filed by the nine agencies.

Figure 4: Patent Applications for Nine Federal Agencies, Fiscal Year 2001

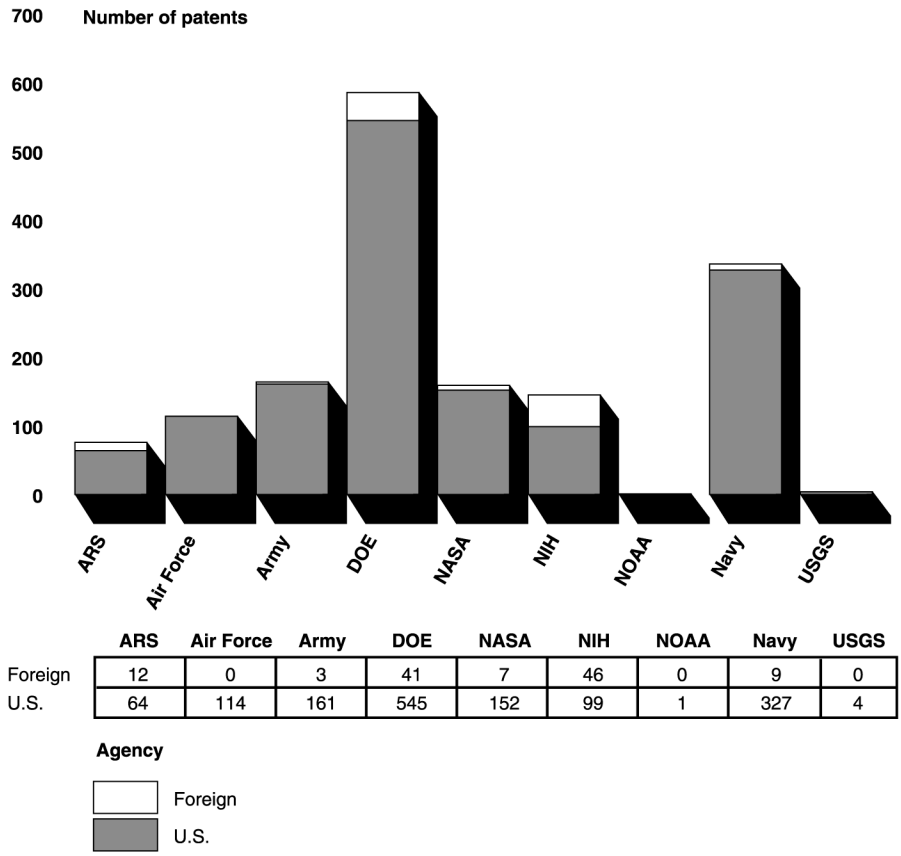


Source: Statistics provided by the agencies cited.

Patents issued and in force

As with disclosures and patent applications, DOE was the leader in total patents issued in fiscal year 2001, accounting for 586, or 37.0 percent, of the 1,585 patents issued to the nine agencies. Six of the nine agencies received foreign patents, with NIH receiving the most. Figure 5 compares U.S., foreign, and total patents for the nine agencies during fiscal year 2001.

Figure 5: Patents Issued to Nine Federal Agencies, Fiscal Year 2001

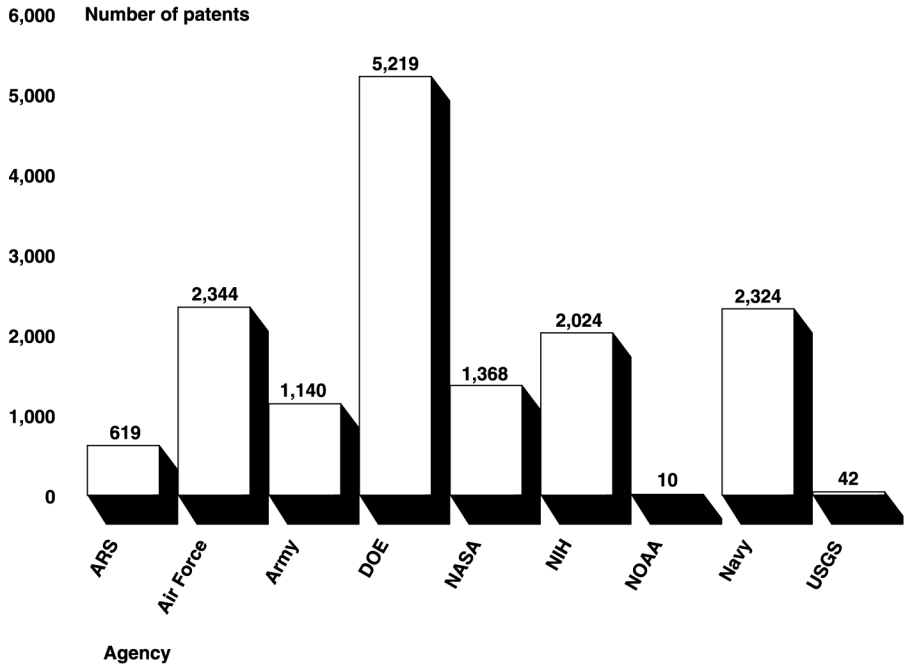


	ARS	Air Force	Army	DOE	NASA	NIH	NOAA	Navy	USGS
Foreign	12	0	3	41	7	46	0	9	0
U.S.	64	114	161	545	152	99	1	327	4

Source: Statistics provided by the agencies cited.

As shown in figure 6, DOE was also the leader in terms of patents in force at the end of fiscal year 2001. Patents in force represent those patents that have been issued to the agency or contractor in the past, have not expired, and presumably are available for licensing.

Figure 6: Patents in Force as of September 30, 2001, for Nine Federal Agencies



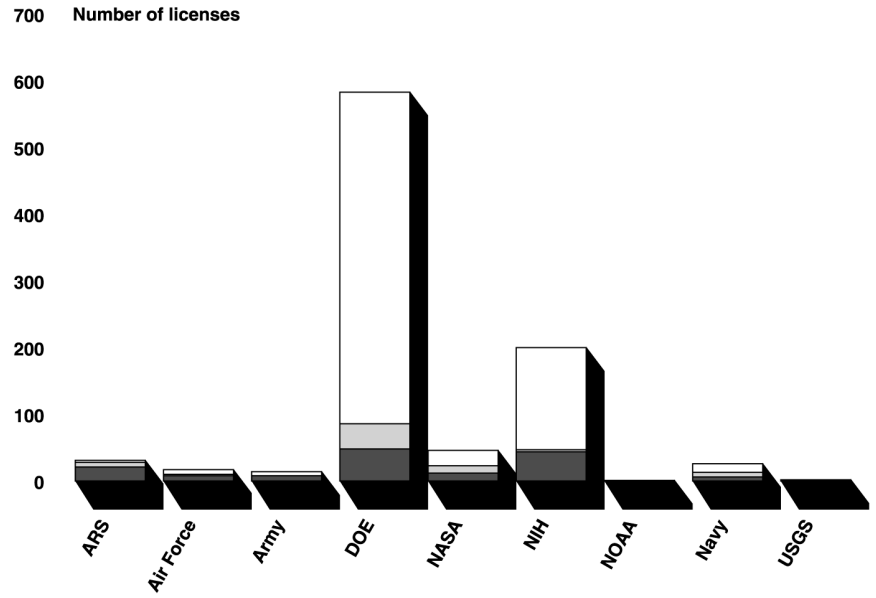
Source: Statistics provided by the agencies cited.

Licenses executed

DOE led the nine agencies in licenses executed, with 583 licenses executed in fiscal year 2001, followed by NIH with 200. No other agency had more than 46. Combined, DOE and NIH accounted for 85.1 percent of all licenses executed during the fiscal year.

The agencies varied widely by type of license executed. As shown in figure 7, over 75 percent of the licenses executed by the nine agencies in fiscal year 2001 were nonexclusive. However, this overall ratio was influenced greatly by DOE, where nonexclusive licenses accounted for 85.2 percent of the licenses it executed, and NIH, where nonexclusive licenses accounted for 76.5 percent. Nonexclusive licenses accounted for only 39.4 percent of all licenses executed by the remaining seven agencies.

Figure 7: Type of Licenses Executed by Nine Federal Agencies, Fiscal Year 2001 by Type of License



	ARS	Air Force	Army	DOE	NASA	NIH	NOAA	Navy	USGS
Nonexclusive	3	7	6	497	23	153	0	13	2
Partially exclusive and other	7	2	0	38	11	3	0	7	0
Exclusive	21	8	8	48	12	44	1	6	0

Agency

Nonexclusive

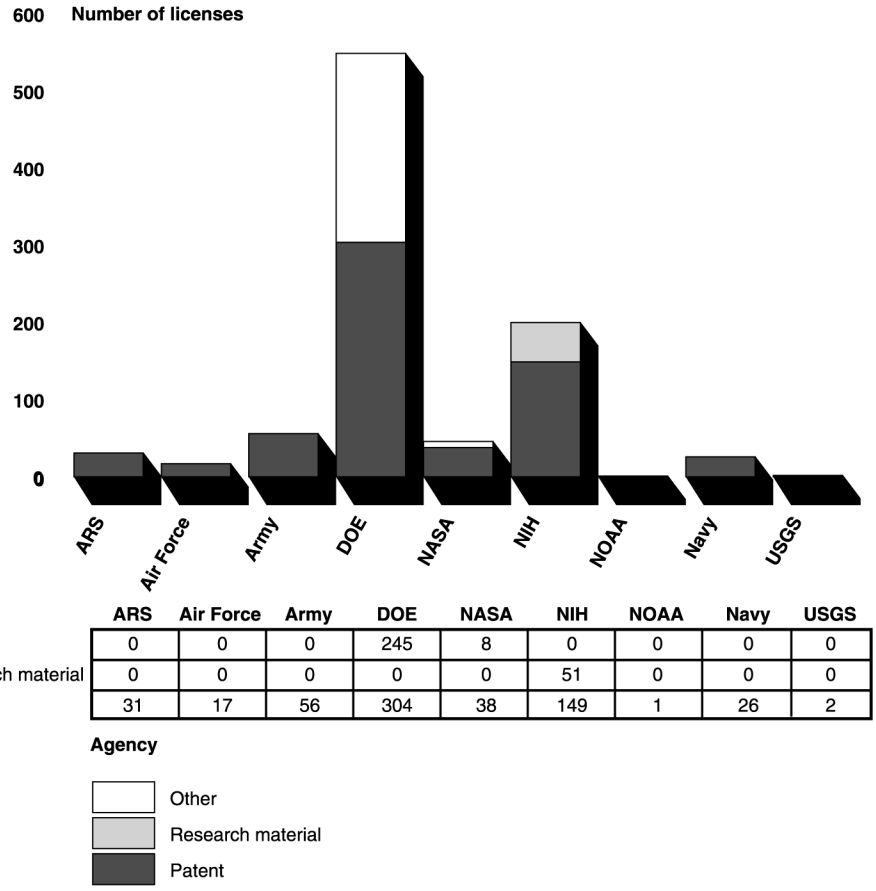
Partially exclusive and other

Exclusive

Source: Statistics provided by the agencies cited.

Over two-thirds of the licenses executed during fiscal year 2001 were based on patented inventions and, in six agencies, patents were the only source of licenses. NIH reported a total of 51 licenses that were based on non-patented research materials, which could include biological materials. In addition, DOE and NASA reported a total of 253 licenses that were based on other types of properties—such as copyrights owned by contractors operating government laboratories. Figure 8 compares licenses executed in fiscal year 2001 by the type of property licensed.

Figure 8: Licenses Executed by Nine Federal Agencies in Fiscal Year 2001 by Type of Property



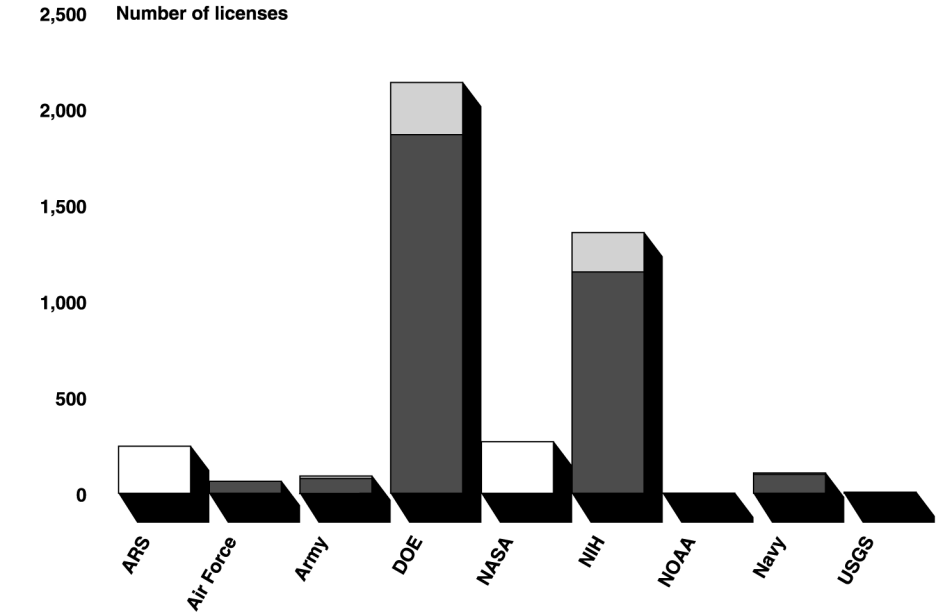
	ARS	Air Force	Army	DOE	NASA	NIH	NOAA	Navy	USGS
Other	0	0	0	245	8	0	0	0	0
Research material	0	0	0	0	0	51	0	0	0
Patent	31	17	56	304	38	149	1	26	2

Source: Statistics provided by the agencies cited.

Licenses in force

DOE and NIH had the most licenses in force at the end of fiscal year 2001, together accounting for over 81.5 percent of all licenses and 96.0 percent of licenses with foreign entities. Figure 9 compares the number of U.S. and foreign licenses in force at the end of fiscal year 2001 for the nine agencies we reviewed.

Figure 9: Licenses in Force for Nine Federal Agencies as of September 30, 2001



	ARS	Air Force	Army	DOE	NASA	NIH	NOAA	Navy	USGS
Undetermined	245	0	0	0	269	0	0	0	0
Foreign	0	0	12	272	0	205	0	7	0
U.S.	0	63	89	1,866	0	1,152	1	99	6

Source: Statistics provided by the agencies cited.

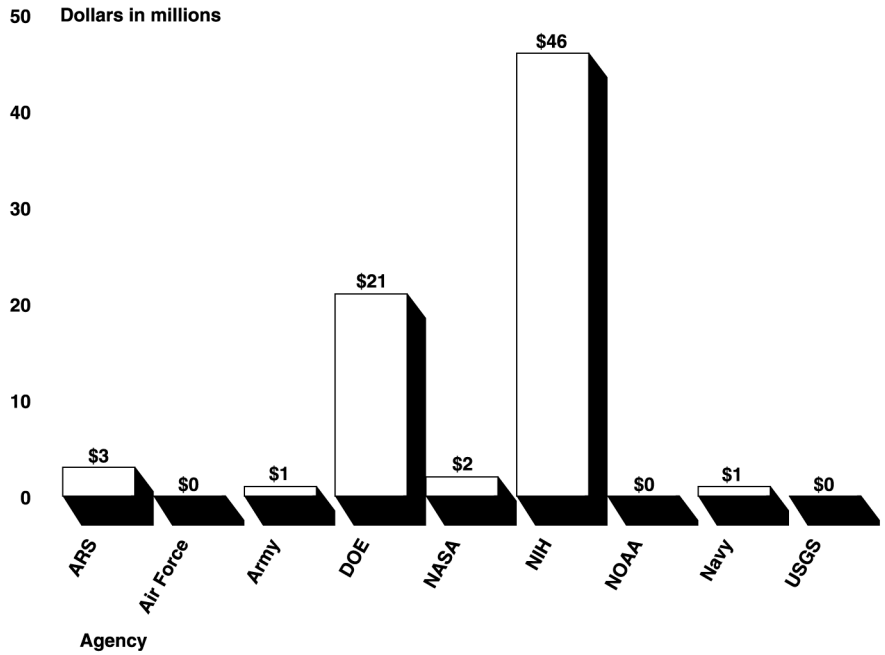
A license in force is one where the agreement between the agency or contractor and the licensee has not expired or been terminated. It does not necessarily mean the license is "active" in the sense of producing income. To the contrary, not all licenses produce income. As shown in appendix IV, table 1, DOE had 2,138 licenses in force at the end of fiscal year 2001, but only 992 licenses produced income during the year. NIH had 1,357 licenses in force at the end of fiscal year 2001, with 697 producing income during the fiscal year. In total, the nine agencies reported 4,286 licenses in force, with 2,056 licenses earning income during the fiscal year.

Licensing income

Despite DOE's having the most invention disclosures, patents, and licenses, figure 10 shows that NIH was by far the leader in licensing

income during fiscal year 2001. Of the nine agencies' licensing income of $74.5 million, NIH accounted for $46.1, or 61.9 percent. DOE accounted for $21.4 million, or 28.7 percent, and the other 7 agencies accounted for $7 million, or 9.4 percent, combined. Figure 10 compares licensing income for the nine agencies.

Figure 10: Licensing Income for Nine Federal Agencies, Fiscal Year 2001



Source: Statistics provided by the agencies cited.

Agency officials cautioned against using output statistics as the sole indicator of the success of their programs. They noted that the agencies are not comparable in regard to such factors as the likelihood that research will result in new technology, the degree to which the technology will require further development before it can be brought to market, and the commercial potential for the products eventually brought to market. The agency officials noted that an agency's technology transfer program is successful if the results of the agency's research are being disseminated to those who can benefit.

A Commerce official agreed that comparing agencies with each other was difficult and that, in some cases, it was even difficult to measure the same agency against itself from year to year. He noted that conditions are

constantly changing as new technologies enter the marketplace, patents expire, new licenses are executed, old licenses expire, etc.

Agencies Did Not Fully Comply with the Reporting Requirements of the Technology Transfer Commercialization Act of 2000

Federal agencies did not fully comply with the requirement of the Technology Transfer Commercialization Act of 2000 that they submit reports on their technology transfer activities to OMB and Commerce as a part of their fiscal year 2003 budget requests. While the Department of Commerce issued guidelines that established a timeline and format for the agencies to follow in developing their reports, these guidelines were not finalized until December 2001. All nine agencies eventually submitted reports to OMB and Commerce, but the reports in some cases were incomplete, contained statistics that were inconsistent or inaccurate, and differed in the data elements used to compile certain statistics. Because submissions by the agencies were submitted in February through July 2002, the information provided by the agencies was received too late to be considered by OMB in the development of the President's budget for fiscal year 2003, which was submitted to the Congress in February 2002. At that time, however, OMB did not have procedures to ensure that agencies transmit the information for consideration in the budgeting process. Moreover, the Department of Commerce was delayed in submitting its own report to the Congress on technology transfer activities nationwide as required by the act.

The reporting problems appear to be largely attributable to the confusion associated with the first year of the act's implementation. Agency officials believe reporting should improve in the future. A Commerce official said that the guidelines may need to be refined to specify what data elements are to be used in accumulating the statistics to be reported.

Department of Commerce Developed Guidelines for Agency Submissions

To ensure some commonality and consistency in the reports the agencies submit to OMB and Commerce, the Interagency Working Group on Technology Transfer—a group of federal agency personnel involved in technology transfer programs that holds periodic meetings at and coordinated by the Department of Commerce—determined a method by which agencies could meet the TTCA reporting mandate. Based on the discussions by the Working Group, Commerce issued guidelines entitled "Annual Reporting on Agency Tech Transfer in Response to the TTCA 2000—Data Elements of the Agency Annual Reports." In this document, which was issued in final form on December 11, 2001, Commerce noted that the guidelines "outline a common response framework for the new statutory reporting process." Commerce also noted that the guidelines,

which are voluntary, were intended to consider and address (1) the annual agency report to OMB required by the TTCA, (2) the materials needed by Commerce to prepare its own report under the TTCA, (3) the types of data the agencies had deemed appropriate in the past in preparing biennial reports[12] on technology transfer required by the Stevenson-Wydler Act, and (4) current policy concerns such as congressional interest in greater information about the tangible downstream outcomes—such as commercialized products or processes, strengthened laboratory capabilities, etc.—resulting from federal technology transfer policies and programs.

The Commerce guidelines, which were sent to all the federal departments and agencies known to have laboratories or technology transfer functions, established an "annual cycle of events," or timeline, for the agencies' reports. In the fall of the year preceding the budget submission, each agency would assemble data from the most recent fiscal year, document its plans for both the current and upcoming fiscal year, and determine how well it had met its plans for the previous fiscal year. In the following January and early February, the agency would finalize its report and submit this with its budget proposal for the upcoming fiscal year. From January to early March, Commerce would review, organize, and compile all the agency reports, tabulate the quantitative data into a consistent format, and draft its own report. Commerce would then submit its report in March or April. Thus, if the Commerce guidelines were followed, the first annual reports by the agencies would have been due in February 2002 and would have been based on the agencies' activities in fiscal year 2001.

The data elements in the Commerce guidelines—which are summarized in appendix V—were organized into three main categories: (1) a description of the agency's present technology transfer programs and plans, (2) data about the agency's technology transfer activities and performance for the recently closed fiscal year, and (3) illustrative case information about the outcomes of the agency's technology transfer programs and activities. The information presented was to include all technology produced in federal facilities, including technology produced in contractor-operated facilities. Commerce emphasized that the guidelines were intended to be a working

[12] The Stevenson-Wydler Act was amended in 1986 to require the Department of Commerce to develop biennial reports to the President and Congress on federal laboratories' utilization of the technology transfer authorities opened to them by federal law. The biennial report requirement was superceded by the reporting requirement of the Technology Transfer Commercialization Act of 2000.

outline for agency reporting and that each agency should adjust its reporting and present additional performance measures in ways it expected would best communicate its activities and achievements. Commerce also said that it would not specify a particular format for each agency's report nor would it distribute a standard survey instrument for gathering data.

In some cases, the Commerce guidelines asked for more data than specified in the TTCA. For example, the Commerce guidelines asked the agencies to report invention disclosures, although this information was not required by the TTCA. Also, the guidelines requested statistical data on cooperative research and development agreements. For statistical data on invention disclosures, patent applications, patent grants, and licenses, the guidelines provided detailed instructions on what information was to be provided and in some cases defined terms that were not specified or defined in the TTCA. A Commerce official noted that the additional information requested by the guidelines had been approved by the members of the Interagency Working Group and was consistent with information the agencies had been providing in the biennial reports previously required by the Stevenson-Wydler Act.

Agencies Were Late in Submitting Data to the Office of Management and Budget

To determine whether federal agencies complied with the TTCA reporting requirements, we reviewed the reports submitted by the nine agencies that, as discussed above, had intramural research budgets of at least $500 million in fiscal year 2001. We found that only ARS among the nine agencies included in our review submitted its report by early February 2002 as suggested by the Commerce guidelines. DOE and NASA submitted their reports in April 2002. Commerce, which included NOAA; DOD—which compiled a consolidated report encompassing the Departments of Army, Navy, and Air Force, and its other agencies; and NIH submitted their reports in June. The Department of Interior, which included USGS, submitted its report in July 2002. The agencies submitted copies of their reports to Commerce at or about the same time they submitted them to OMB, although in some cases they had provided Commerce with draft information while working on their official submissions.

Commerce also sent the TTCA guidelines to three other agencies—the Environmental Protection Agency, the Department of Veterans Affairs, and the Department of Transportation—that were not among the agencies we selected for our review. According to a Commerce official, the Environmental Protection Agency and the Department of Veterans Affairs submitted their reports in May and June 2002, respectively. At the time of

our review, the Department of Transportation had not yet submitted a report.

OMB staff, while acknowledging that the agency did not have any special procedures to ensure that agencies transmit technology transfer information for consideration in the budgeting process, explained to us that submissions received in February through July 2002 would have been too late to consider in the development of the President's fiscal year 2003 budget, which was released in early February 2002. However, they noted that these submissions could be considered in formulation of the President's fiscal year 2004 budget. The staff also said that OMB is examining the incorporation of guidance on reporting on technology-transfer activities into Circular A-11, which provides agencies with instructions on preparation and submission of budget materials.

Agency Statistics Provided to OMB and Commerce in Some Cases Were Incomplete, Inaccurate or Inconsistent, or Differed in the Data Elements Used to Compile Them

The Commerce guidelines requested that, in submitting the reports required by the TTCA, the agencies include statistical data on their technology transfer activities for fiscal year 2001. Specifically, the agencies were asked to provide information on the number of CRADAs; number of inventions disclosed, patents applied for and patents received; number of licenses active and terminated; the number of active licenses that produced income; amount of income by source; characteristics of earned royalty income received; disposition of license income; and the time elapsed in obtaining license agreements. Tables 12 through 19 of appendix VI summarize the statistics each of the nine agencies provided in these categories.

We did not independently verify the statistics the nine agencies provided to OMB. However, we did review the statistics for completeness and, where possible, for consistency with data the same agencies had provided us on their technology transfer activities. We found that, in some instances, the TTCA reports were incomplete. For example, some agencies did not provide statistics on the disposition of license income or the average number of days elapsed between the time potential licensees applied for licenses and the time the licenses were executed.

In five categories, the data requested by the Commerce guidelines appeared to be identical to the information we had requested from the agencies and included in appendix IV. These categories were invention disclosures, patents issued, licenses executed, licenses earning income, and licensing income received during fiscal year 2001. For each of these categories, we compared the statistics the agencies provided to OMB and

Commerce with the data they provided us. As shown in tables 20 through 24 of appendix VII, we found that the statistics sometimes were inconsistent, and we asked the agencies reporting the statistics to explain the differences. In some cases, we found that the information provided to OMB and Commerce was inaccurate. For example:

- DOD submitted a consolidated report but listed the services separately. In comparing the statistics provided to OMB and Commerce with those provided to us, we noted that the Navy's statistics varied in all five of the categories compared, the Army varied in four, and the Air Force varied in three. DOD officials said the differences were the result of the services' having accumulated the statistics for their consolidated report to OMB and Commerce earlier in the year than those provided to us. They said that the statistics provided to us were updated and more reliable.

- DOE reported more than twice as many—583 to 226—new licenses executed during the fiscal year to us than in its TTCA report because, according to DOE officials, the figures provided to OMB and Commerce did not include licenses for copyrights and other non-patent types of intellectual property. DOE also reported more invention disclosures, patents issued, and licenses with income to OMB and Commerce than it did to us for reasons that the agency was not able to determine.

We also found that the agencies were not always using the same data elements in developing statistics for their TTCA reports. In compiling statistics on patents issued, for example, some agencies may have included foreign patents while others did not. Similarly, in reporting the number of newly-executed licenses, some agencies reported licenses for intellectual property other than patents while other agencies did not.

To some extent, the reporting problems may stem from a lack of specificity in Commerce's guidelines. For example, the Commerce guidelines specified that statistics on patent applications should include both U.S. and foreign applications. The guidelines were silent, however, on whether the statistics on patents received should include foreign patents. A Commerce official acknowledged that the guidelines may need some revision to ensure that the agencies are basing their statistics on the same data elements.

Commerce Was Delayed in Developing a Consolidated Report

Because the agencies did not submit their reports under the TTCA according to the timeline set out in Commerce's guidelines, Commerce was delayed in developing its own consolidated report on federal technology transfer activities as required by the TTCA. A Commerce official told us that, even after receiving the agency reports, Commerce had to (1) collate and summarize information that sometimes differed in form and detail, (2) contact agencies to resolve or explain potentially inconsistent or missing data, and (3) coordinate its work with the Attorney General and the U.S. Patent and Trademark Office (USPTO) as required by the TTCA.

Commerce eventually developed its consolidated report entitled *Summary Report on Federal Laboratory Technology Transfer* and placed it on the Department of Commerce's Web site on October 16, 2002. A Commerce official said the agency anticipated having published versions of the report available for submission to the President and to the Congress shortly.

Reporting Problems Appear Related to Uncertainties and Confusion During the First Year of the Act's Implementation

A Commerce official said that the problems in TTCA compliance were largely due to the uncertainties and confusion associated with the first year of reporting. One problem was that the guidelines had not been finalized until less than 2 months before OMB was to present the overall federal budget. Also, some agencies had difficulties in defining and accumulating some of the data needed, particularly where their technology transfer programs were decentralized. DOD, for example, does not have a centralized data tracking system that allows the prompt accumulation of such data. Thus, each of the military services had to query individual research units to obtain data and then collate these into a summary report. Similarly, DOE had to query its individual laboratories to obtain data in some cases, even though it has a centralized tracking system.

Officials from Commerce and other agencies said that the TTCA compliance problems should be reduced in future years because of the guidelines that are now in place and the experience gained during the first year of reporting under the TTCA. However, some officials were concerned about how the information might be interpreted. They said that, as discussed earlier, it was inappropriate to compare agencies by looking solely at statistics. Rather, they believed each agency's technology transfer program must be evaluated in the context of that agency's mission, priorities, and potential. They were concerned that those wanting to use the data would not be able to put these statistics into the proper context

and might arrive at conclusions about an agency's technology transfer activities that were unfounded.

A Commerce official acknowledged that there had been some confusion in the agencies' interpreting and applying the guidelines for preparing the reports required by the TTCA, even though (1) the Interagency Working Group had participated in their development and (2) much of the information requested was similar to what the agencies had been reporting under the biennial reports previously required by the Stevenson-Wydler Act. He said that Commerce would probably revise the guidelines to make them more specific and to emphasize the need for each agency to provide complete data.

Agency Actions to Improve Contractor and Grantee Reporting under the Bayh-Dole Act Do Not Address Underlying Causes of Noncompliance

In an August 1999 report, we found that contractors and grantees were not always complying with the reporting requirements of the Bayh-Dole Act and, by extension, Executive Order 12591.[13] Since the issuance of that report, four of the five agencies we reviewed have taken some steps to improve compliance. However, these efforts have not addressed underlying problems we reported, such as duplication in reporting requirements, that make reporting difficult and cumbersome.

The attempts at improving compliance varied among the agencies. NIH said that it has made additional efforts to educate its contractors and grantees on the importance and mechanics of reporting technology transfer activities and was redesigning its monitoring system. DOD said it has not taken agency-wide action but that various units have taken such steps as adopting a new monitoring system and putting an increased emphasis on reviewing documentation submitted at the end of research projects to identify unreported inventions. DOE said it has implemented a new centralized monitoring system that has reduced its backlog in recording with the USPTO certain invention notifications submitted to DOE by its contractors and grantees. NASA said it has implemented a new invention reporting system and integrated this system with an existing database and tracking system. NSF said it has made no changes. Agency officials said that they had not been able to standardize, improve, and

[13] U.S. General Accounting Office, *Technology Transfer: Reporting Requirements for Federally Sponsored Inventions Need Revision*, GAO/RCED-99-242 (Washington, D.C.: Aug. 12, 1999).

streamline the reporting process itself because, as we noted in the 1999 report, this would require congressional action.

GAO Documented Compliance Problems in 1999 Report

Under the Bayh-Dole Act—and, by extension, Executive Order 12591—contractors, grantees, and recipients of CRADAs can elect to retain title to inventions they create under government research projects. However, they are required to follow specific reporting requirements regarding the disclosure, election to retain title, application for patent, licensing, and commercialization of any invention subject to the act or executive order. Some of the key reporting requirements include disclosing any new invention within 60 days, electing to retain title within 2 years, applying for a patent within 1 year of election, and providing documentation (the "confirmatory license") specifying that the government has rights in the invention.

We issued a report on Bayh-Dole Act compliance in August 1999. We noted in this report that federal agencies and their contractors and grantees were not complying with the requirements of the Bayh-Dole Act and Executive Order 12591. We found that the databases for recording the government's interests in the inventions were inaccurate, incomplete, and inconsistent and that some inventions were not being recorded at all. As a result, the government was not always aware of the inventions to which it had royalty-free rights. We also found that, to some extent, the problems were systemic, as the contractors and grantees were being required to submit duplicate reports, that the confirmatory licenses were filed in a database at the USPTO that was largely inaccessible and unused, and that the USPTO was not involved in oversight.

We noted that the Congress might wish to consider enhancing the data available on federally sponsored inventions by standardizing, improving, and streamlining the reporting process for inventions subject to the act and executive order. Specifically, we noted that the Congress could (1) require the Secretary of Commerce to develop standardized disclosure forms and utilization reports for federally funded inventions, (2) make the patent the primary control mechanism for reporting and documenting the confirmatory license, and (3) requiring the USPTO to provide information to the funding agencies to assist them in monitoring compliance. We also included in the 1999 report some of the options we had discussed with agency officials and others for improving compliance. These options are shown again in appendix VIII of this report.

Agencies Have Taken Limited Actions to Improve Compliance

The TTCA includes a requirement for utilization reports for inventions created in federal facilities but does not address the reporting compliance problems we raised in our 1999 report. Moreover, Commerce has not addressed these issues through revised regulations. To determine whether individual funding agencies have taken actions on their own to address the compliance issues we had raised, we contacted the five funding agencies that were included in our 1999 report: DOD, DOE, NASA, NIH, and NSF. We found that all but one of the agencies had taken some action, but that the actions varied in scope and application.

DOD

DOD has taken no agency-wide actions to improve compliance with the reporting requirements of the Bayh-Dole Act, because the responsibility for monitoring technology created through extramural research programs is left to the individual services and agencies. Even at this level, oversight of compliance is sometimes decentralized. Thus, we asked each of the military services to outline any changes they have made to improve compliance with reporting requirements. In this regard, the Air Force said that it has started using NIH's monitoring and tracking system for grant-related reporting at its Office of Scientific Research Division.

The Navy responded that it has done nothing agency-wide except work with other federal agencies to establish uniform reporting requirements for reporting inventions under Federal Assistance Agreements in response to the Federal Financial Assistance Management Improvement Act of 1999.[14] One Navy official said he expected to have a Federal Register Notice policy letter on this subject in the near future. Within the agency, the Office of Naval Research had undertaken two initiatives. One was to contract with two retired Navy patent attorneys to check the accuracy of inventions reported on forms submitted by contractors and grantees at the close of their research projects. This initiative has resulted in the identification of several unreported inventions. The second initiative concerns a study of ways to modify procurement procedures to improve the probability of technology transitions, including the identification of inventions.

The Army also has made no agency-wide changes in response to our 1999 report. However, the patent attorneys assigned to individual Army commands and units reported changes they have made. Some of the changes include revising filing systems to improve followup on invention

[14] P.L. 106-107, Nov. 20, 1999.

disclosure reports, making specific requests for contractors to complete confirmatory licenses, submitting information to contractors related to the rights they and the government have in inventions, instituting a new database for recording confirmatory licenses, requiring contractors to report through NIH's "Interagency Edison" (iEdison) system, improving training in inventions reporting, and establishing a Web site for contractors that outlines reporting requirements.

DOE

DOE officials said they have reduced the backlog in their filing of confirmatory licenses with the USPTO through the implementation of two efforts to improve tracking. The first was the implementation of a centralized DOE database, with data entry being done by the applicable field office. This system includes codes showing when confirmatory licenses are required, have been received, have been sent to headquarters for filing, and have been sent to the USPTO for recording. The second effort involved a change in the database to be able to verify that a contractor or grantee has elected to retain title to an invention within the required period and to show that the USPTO has recorded the confirmatory license.

NASA

A NASA official said NASA has taken several steps to improve compliance since our 1999 report was issued. First, NASA adopted a policy to clarify within the agency that software created by or for NASA was a valuable technology and was to be reported and administered as any other invention, discovery, improvement, or innovation. Second, NASA implemented a Web-based system—integrated into its tracking and monitoring system—that contractors and grantees can voluntarily use to report inventions. Third, NASA issued new policy guidance to formalize existing NASA policies on reporting new technologies and innovations.

NIH

NIH noted that our report had not led to any formal changes to reporting regulations but that, nonetheless, NIH has taken action by actively engaging in outreach and contractor/grantee education and by refining the agency's electronic monitoring and tracking system to reinforce the importance of Bayh-Dole Act reporting. From an outreach standpoint, NIH began, in fiscal year 2000, a series of proactive site visits "intended to facilitate dialogue regarding NIH policies and statutory regulations in a non-crisis, non-adversarial manner." These site visits were also seen as a "means to enhance administrative oversight of sponsored research and enhance compliance."

Each NIH site visit consisted of interviews with key staff and a seminar where specific reporting requirements and compliance topics were

discussed. NIH conducted 10 such visits in fiscal year 2000 and an additional 8 visits in fiscal year 2001. The fiscal year 2001 visits were expanded to include invitations to contractors and grantees within the same geographic area. NIH also put together, on its Web site, a compendium of observations and comments from the fiscal year 2000 site visits. In addition, NIH expanded its outreach through presentations on reporting compliance at NIH-sponsored conferences.

NIH also said that it has taken steps to improve compliance with reporting requirements by redesigning its iEdison electronic invention tracking and monitoring system. NIH unveiled Edison in 1995 and the system was regarded as a success. However, concerns recently have been raised that it is using old technology in some cases. Thus, in fiscal year 2001, NIH began a substantial redesign of Edison, incorporating suggestions and refinements offered by a working group of institutional administrators. The new system is scheduled for deployment in the fall of 2002. NIH has also undertaken efforts to encourage more federal agencies to employ iEdison as its own monitoring and tracking system. NIH noted that an additional eight agencies have joined iEdison since our 1999 report and said it was obtaining input from these agencies as a part of the iEdison redesign project.

NIH noted that its efforts to improve compliance have led to a substantial increase in the number of inventions and patents being reported. By using iEdison, the entire reporting process—with the exception of three documents required by law to be in writing—is now electronic. Although the increase in reporting under iEdison has created a backlog in NIH's acknowledgement of receipt of documents, NIH has added support staff to address the problem.

NSF

NSF officials said they have made no changes in response to our 1999 report.

Agency Officials Say Correcting Underlying Causes May Require Congressional Action

We did not attempt to determine whether the actions taken unilaterally by the agencies have improved Bayh-Dole Act reporting compliance by contractors and grantees. However, the actions have not addressed the systemic problems—such as duplicate reporting—that we noted in our 1999 report.

Officials from the five funding agencies contacted told us that, while they have taken and will continue to take actions to improve compliance by contractors and grantees, they are not in a position to make some of the

changes suggested by our 1999 report, such as duplication in reporting requirements, making the patent the sole instrument for documenting the confirmatory license, and involving the USPTO in the oversight function. Thus, while they generally believed the options we raised in our 1999 report had merit, they believed the options required congressional action to implement. Department of Commerce officials agreed with this assessment.

Conclusions

To be useful to the Congress, the annual reports the Technology Transfer Commercialization Act of 2000 requires federal agencies to submit to OMB and the Department of Commerce must be timely, complete, accurate, consistent in the data elements that make up the statistics, and presented in a meaningful way. In some cases, these characteristics were missing in the first year of reporting under the act. The agencies were late in reporting; the reports were sometimes incomplete, inconsistent, or inaccurate; and the statistics reported were not always based on the same data elements. Moreover, OMB did not have any special procedures in place for accumulating the data so that such data could be considered in developing the President's annual budget submission to the Congress.

Officials from the Department of Commerce and the agencies submitting reports under the act believe that the lessons learned in the first year should improve future reporting. While this may be the case, we believe that the Department of Commerce and OMB need to take additional steps to ensure that the reports received are consistent in the data they contain and that they are made a part of the annual budget process. In this regard, the Department of Commerce needs to revise its guidelines to clarify what data should be included in the reports and how the data should be presented. In addition, OMB needs to develop procedures for accumulating the information so that it can be considered in developing the President's budget.

Recommendations for Executive Action

We recommend that the Secretary of Commerce revise the guidelines issued to agencies for use in preparing the annual reports to be submitted to OMB and Commerce as required by the Technology Transfer Commercialization Act of 2000. The guidelines should clarify the precise data elements to be included in each of the statistical categories, thereby improving the level of precision in and comparability of the agency reports.

We also recommend that the Director of the Office of Management and Budget develop procedures for accumulating and considering, as a part of

the annual budget process, data submitted by federal agencies in the annual reports on technology transfer required by the Technology Transfer Commercialization Act of 2000.

Agency Comments and Our Evaluation

We provided a copy of our draft report to the Department of Commerce and the Office of Management and Budget for review and comment. Commerce made favorable comments about the draft report, saying that it was "useful" and provided a realistic analysis of the first cycle of the new reporting process under the Technology Transfer Commercialization Act of 2000. Commerce said that our recommendations were reasonable and that their adoption would improve reporting during the next cycle.

Commerce noted that its own summary report mandated by the act would discuss technology transfer activities governmentwide. Commerce was concerned some persons might be confused if they tried to compare the statistics in the Commerce report with those in our report, which addressed the activities of a "selected subset" of nine agencies, and recommended that we "note this discrepancy." While we agree that the reports have different statistical bases, we believe our report is clear on this point; thus, we made no changes in this regard. Commerce also noted that it had worked closely with federal agencies providing statistics for its summary report, that it would be including information in some categories where GAO said the statistics were "not provided," and that it would be pleased to provide us with its most current agency data. We obtained the updated statistics and, where appropriate, revised our report to include these as well as certain other minor clarifications suggested by the Commerce official providing the data.

Commerce agreed with our recommendation dealing with the guidelines. Commerce also noted that it had devoted substantial effort to preparing the earlier guidelines but that the "detail of the data requested, the importance of clear definitions, and the evolving state of the federal labs' databases concerning their technology transfer activities emphasize the importance of continuing review of data collection procedures." In this regard, Commerce said it had already included this topic on its agenda for near-term discussion with the Interagency Working Group on Technology Transfer so that the necessary changes could be made before the next cycle of agency reporting gets underway.

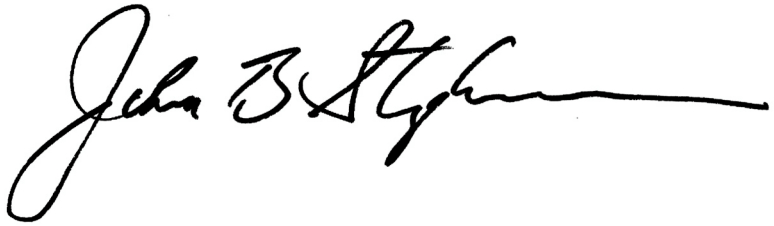
Finally, Commerce agreed with our recommendation that OMB play a larger role in developing procedures for accumulating, collating, and reporting the data required by the Technology Transfer Commercialization

Act of 2000. Commerce noted that uncertainties about the submission process were a contributing factor to agencies' being late in submitting their reports during the first year of the act's implementation and said that, even though the agencies submitting reports to OMB and Commerce should have some flexibility, specific guidance from OMB would clarify what the reporting agencies are to do. The full text of the comments provided by the Department of Commerce is included as appendix IX.

OMB, in oral comments, said that the overall thrust of our recommendation that it develop procedures for accumulating and considering agency information, as part of the annual budget process, was reasonable. OMB added that as a result of the information presented in the draft report, it would consider incorporating guidance on reporting on technology transfer activities into Circular A-11, which provides agencies with instructions on preparation and submission of budget materials to OMB. OMB also provided some technical clarifications that we incorporated as appropriate.

We conducted our work from October 2001 through September 2002 in accordance with generally accepted government auditing standards. Appendix I contains the details of our scope and methodology.

We will send copies of this report to the appropriate House and Senate committees; interested Members of Congress; the Secretary of Commerce; and the Director, Office of Management and Budget. We will also make copies available to others upon request. The report will also be available at no charge on the GAO Web site at http://www.gao.gov. If you have any questions about this report, please call me at (202) 512-6225. Key contributors to this report are listed in appendix X.



John B. Stephenson
Director, Natural Resources
and Environment

List of Committees

The Honorable Patrick J. Leahy
Chairman
The Honorable Orrin G. Hatch
Ranking Minority Member
Committee on the Judiciary
United States Senate

The Honorable Ron Wyden
Chairman
The Honorable George Allen
Ranking Minority Member
Subcommittee on Science, Technology,
and Space
Committee on Commerce, Science,
and Transportation
United States Senate

The Honorable Howard Coble
Chairman
The Honorable Howard L. Berman
Ranking Minority Member
Subcommittee on Courts, the Internet, and
Intellectual Property
Committee on the Judiciary
House of Representatives

The Honorable Vernon J. Ehlers
Chairman
The Honorable James A. Barcia
Ranking Minority Member
Subcommittee on Environment, Technology,
and Standards
Committee on Science
House of Representatives

Appendix I: Scope and Methodology

As required by the Bayh-Dole Act and the Technology Transfer Commercialization Act of 2000 (TTCA), we conducted our periodic review on the implementation of both acts. In discussions with staff from the appropriate committees, we agreed to provide information on how federal agencies had identified, patented, and licensed inventions created in their own facilities during fiscal years 1997-2001. We agreed that we would also determine (1) the extent to which the agencies complied with the TTCA requirement to submit reports on their technology transfer activities to the Office of Management and Budget and the Department of Commerce at the time they submit their fiscal year 2003 budget requests and (2) what the agencies have done—since the issuance of our 1999 report on the issue—to improve compliance with reporting requirements under the Bayh-Dole Act for inventions created under contracts and grants.

For our first objective, we reviewed reports on research funding prepared by the National Science Foundation (NSF) showing estimated intramural and extramural research obligations for each federal agency for fiscal year 2001. Using these reports, we selected nine agencies that had obligated at least $500 million in intramural research funds during the fiscal year. These agencies were the Agricultural Research Service (ARS) within the Department of Agriculture; the Department of the Air Force within the Department of Defense (DOD); the Department of the Army within DOD; the Department of Energy (DOE); the National Aeronautics and Space Administration (NASA); the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce; the National Institutes of Health (NIH) within the Department of Health and Human Services; the Department of the Navy within DOD; and the U.S. Geological Survey (USGS) within the Department of the Interior. For each of these agencies, we interviewed officials and reviewed documentation to obtain information on the design and approach of their programs for transferring technology created in the agencies' facilities by agency employees and contractors. We also asked each agency to provide (1) statistics on its technology transfer output or activities for fiscal years 1997 through 2001 to the extent such statistics were available and (2) specific examples of the types of technologies it had developed.

For our second objective, we obtained the guidelines developed by the Department of Commerce, in conjunction with the Interagency Working Group on Technology Transfer, to assist federal agencies in preparing annual reports required by the TTCA. We then contacted each of the nine agencies we had selected under our first objective to determine how those agencies had complied with the TTCA reporting requirements. In this regard, we obtained the agencies' reports where available, compared these

to the data we obtained from the agencies under the first objective, attempted to resolve any anomalies in the data with the agency officials, and met with officials to determine what problems they encountered in complying with the TTCA requirements and the Commerce guidelines. We also held discussions with Commerce and Office of Management and Budget (OMB) officials regarding overall compliance and the use that these agencies were making of the individual agency reports in fulfilling their own requirements under the TTCA.

For our third objective, we analyzed the activities of the agencies that were included in our 1999 report on the Bayh-Dole Act entitled *Technology Transfer: Reporting Requirements for Federally Sponsored Inventions Need Revision* (GAO/RCED-99-242, Aug. 12, 1999). These agencies were DOD, DOE, NASA, NIH, and NSF. We contacted each of these agencies and asked them to provide information on what they had done to improve compliance by contractors and grantees under the Bayh-Dole Act since the issuance of our report

We did not independently verify the statistical information provided by the agencies. However, we did ask for clarification in cases where the statistics we obtained for our first objective appeared to conflict with statistics that the same agencies provided to OMB and Commerce that we reviewed as a part of our second objective.

We conducted our work from October 2001 through September 2002 in accordance with generally accepted government auditing standards.

Appendix II: Federal Obligations for Research and Development, Fiscal Year 2001, for Nine Selected Agencies

Dollars in millions[a]

		Research type		Character of work		
Agency	**Total[b]**	**Extramural**	**Intramural**	**Basic**	**Applied**	**Development**
Agricultural Research Service	$968.7	$40.8	$927.9	$523.1	$358.4	$87.2
Air Force	13,745.6	12,662.1	1,083.5	206.9	590.9	12,947.8
Army	5,310.7	3,238.3	2,072.4	204.3	639.0	4,467.4
Department of Energy	6,793.5	5,922.4	871.0	2,383.6	2,140.0	2,269.8
National Aeronautics and Space Administration	9,602.4	7,105.5	2,496.9	1,898.3	2,802.7	4,901.4
National Institutes of Health	17,870.4	14,789.8	3,080.7	10,397.1	5,115.5	2,357.8
Navy	8,748.6	5,402.6	3,346.0	396.1	532.8	7,819.7
National Oceanic and Atmospheric Administration	591.2	86.0	505.2	5.2	562.9	23.1
United States Geological Survey	553.8	36.8	517.0	55.4	463.8	34.6
Total for nine agencies[b]	**$64,184.9**	**$49,284.3**	**$14,900.6**	**$16,070.0**	**$13,206.0**	**$34,908.8**
Total for all agencies[b]	**$81,526.2**	**$62,173.6**	**$19,352.4**	**$20,274.4**	**$18,413.7**	**$42,838.1**

[a]Statistics are based on preliminary estimates.

[b]Totals may vary because of rounding.

Source: National Science Foundation.

Appendix III: Descriptions of Technology Transfer Programs Established by Nine Selected Federal Agencies

There is no single agency overseeing technology transfer in the federal government. Rather, each agency with laboratories or otherwise involved in technology transfer establishes its own program tied to its mission, objectives, and priorities. The following are brief descriptions of the research and technology transfer programs of nine federal agencies with intramural research obligations of at least $500 million in fiscal year 2001.

Agricultural Research Service

The Agricultural Research Service (ARS) is the principal in-house research agency of the U.S. Department of Agriculture. ARS' mission is to conduct research to develop and transfer solutions to agricultural problems of high national priority; provide access to and disseminate information to ensure safe food and other high-quality agricultural products; assess the nutritional needs of Americans; sustain a competitive agricultural economy; enhance the natural resource base and the environment; and provide economic opportunities for rural citizens, communities, and society as a whole.

ARS also works to ensure the timely transfer of new knowledge and technologies to potential users. In this regard, ARS seeks to broaden public understanding of the value of agriculture and agricultural research to ensure the continued primacy of U.S. agriculture in the 21st century.

Research

ARS conducts research at over 100 locations across the country and at four overseas laboratories. ARS' research is organized into 22 national programs. These programs are intended to bring coordination, communication, and empowerment to the more than 1,200 research projects carried out by ARS. The programs focus on the relevance, impact, and quality of ARS research.

In fiscal year 2001, ARS obligated a total of $968.7 million for research and development. Of this amount, $523.1 million, or 54 percent, went to basic research; $358.4 million, or 37 percent went to applied research; and the remaining $87.2 million, or 9 percent, went to development. Most of this funding was obligated for ARS' own laboratories, with $927.9 million, or 95.8 percent, for intramural research, and $40.8 million, or 4.2 percent, for extramural research.

Technology Transfer

The Secretary of Agriculture has delegated ARS the authority to administer the technology transfer program department-wide. ARS has centralized its technology transfer activities in its Office of Technology

Transfer (OTT), which is responsible for protecting intellectual property, developing strategic partnerships with outside institutions, and performing other appropriate functions to enhance the effective transfer of ARS technologies to users.

OTT is organized into four sections:

- The administrative/headquarters section coordinates the development of technology transfer policy and signs licenses and cooperative research and development agreements (CRADA).
- The patent section assists scientists in protecting intellectual property, coordinates invention reports, prepares and prosecutes patent applications, and oversees patent applications prepared by contract law firms.
- The licensing section conducts marketing for selected technologies and negotiates licenses for intellectual property.
- The marketing section conducts targeted marketing and distributes information on technologies that are available for licensing or cooperative partnerships and publicizes information about the commercial successes of ARS research.

Technology Transfer Coordinators are located at field locations and are responsible for facilitating the development and effective transfer of technologies. They serve as liaison with the agency's own scientists and managers as well as universities and the private sector. They also have the authority to negotiate CRADAs, licenses, and other technology transfer agreements.

As shown in table 1 of appendix IV, ARS received $2.6 million from licensing income during fiscal year 2001, ranking behind only National Institutes of Health (NIH) and the Department of Energy (DOE) among the nine agencies included in our review. However, an ARS official said that generating income is not the primary objective of their technology transfer program. He said that, while intellectual property protection may be required to justify the cost of commercial development by a licensee, many excellent original ideas are best transferred to those who need the information by using scientific publications or other methods—such as electronic media, field days, demonstration projects or public release—that do not involve patenting. If protection is needed, it generally is achieved through applying for a patent. In deciding whether to seek a

patent, ARS' first consideration is to determine if protection would enhance the likelihood that the technology will be transferred to the private sector.

ARS generally grants exclusive or partially exclusive licenses. Of the 31 new licenses executed in fiscal year 2001, for example, 21 were exclusive and 7 were partially exclusive. An ARS official said that most companies would not spend the resources necessary to develop and market a product unless they are granted a license with some degree of exclusivity. License fees and royalties are negotiated on a case-by-case basis and depend upon several factors, including the scope of rights granted, the size of the potential market, and the time and financial investment required by the licensee to bring a product to market. Negotiated royalty rates are based upon the anticipated profit margins for the product to be marketed by the licensee.

ARS license income is distributed in compliance with the Federal Technology Transfer Act of 1986. Government inventors collectively divide, as an incentive award, the first $2,000 of income received by ARS from each license and 25 percent of the income over $2,000 each year up to a maximum of $150,000 per inventor each year.

Examples of Technologies Developed

ARS has had a number of successful technology transfer outcomes. For example, ARS received royalties from three of its patented soybean varieties, which have been licensed to three different companies. The varieties are the first improved forage-type soybean cultivars bred for animal feed and can be used for grazing, hay or silage over a wide geographic area of the United States. ARS also made 46 plant germplasm releases to U.S. farmers, nurseries, breeders, and researchers to help speed transfer of those technologies to the public.[1] The releases included a new citrus rootstock and new wheat, dry pea, potato, soybean, chickpea, lentil, grape, raisin, blueberry, small dry bean, and plum varieties as well as several new germplasm lines with enhancements or improved qualities.

ARS is also working with another U.S. Department of Agriculture agency and the Florida Department of Agriculture and Consumer Services on a 5-year initiative to help U.S. southern states combat Red Imported Fire

[1] Genes necessary for crop improvement are contained in a broad array of plant materials that, when used in breeding or genetic research, are termed "germplasm."

Ants. Under the initiative, Florida's Department of Agriculture and Consumer Services will rear a special fly species that specifically parasitizes fire ants. The flies will then be shipped to state-managed field sites for release in southern states. ARS researchers brought the fly to their U.S. facilities several years ago from Brazil, and have since mastered biological control strategies using the fly to attack fire ant populations.

Department of the Air Force

The mission of the Department of Air Force is to defend the United States and protect its interests through aerospace power. Achieving this mission requires competencies in aerospace superiority, global attack, rapid global mobility, precision engagement, information superiority, and agile combat support.

Research

The Air Force's primary research arm is the Air Force Research Laboratory, which itself is a component of the Air Force Materiel Command. The Air Force Research Laboratory's mission is to lead the discovery, development, and integration of affordable war-fighting technologies for the aerospace forces. The laboratory conducts and sponsors research and development through nine technology directorates devoted to specific research areas and located throughout the United States.

In fiscal year 2001, the Air Force obligated a total of $13.7 billion for research and development, with $206.9 million, or 1.5 percent, for basic research; $590.9 million, or 4.3 percent, for applied research; and $12.9 billion, or 94.2 percent, for development. The majority of the research and development budget went to contractors and grantees, with $12.6 billion, or 92.1 percent, spent on extramural projects and $1.1 billion, or 7.9 percent, spent on intramural projects.

Technology Transfer

The Air Force Research Laboratory manages the Air Force's technology transfer program for intramural research. However, the program itself is decentralized, with each directorate having its own technology transfer focal point and intellectual property team. The technology transfer program team's primary objective is to enhance management of technology transfer through streamlining the program execution and providing guidance. Decisions on patenting and licensing are handled at the directorate level. If the intellectual property team in a directorate decides an invention should be patented, the Air Force Research Laboratory pays for the costs of obtaining the patent as well as the first

maintenance fee.[2] Thereafter the directorates elect whether to pay the second and third maintenance fees. Similarly, the individual teams in the directorates are responsible for attempting commercialization and executing licenses for the technologies.

According to an Air Force official, the Air Force seeks patent protection on inventions that have significant military potential or commercial value. In this regard, the Air Force is ensuring that the government's rights in federally funded technologies are protected for future use by the Department of Defense (DOD). The official said that the Air Force seeks to develop and exploit its inventions through CRADAs and patent licenses, with one of its objectives being the potential cost savings to DOD and the public that can be realized through higher volume production. He also noted, however, that the Air Force has had limited success in translating inventions developed primarily for military purposes into commercial products.

The Air Force has no centralized database or monitoring system for Air Force inventions. Rather, the inventions are tracked by the directorates that created them. The Air Force is in the process of implementing an information management system originally developed by the Navy. When operational, this system will serve as a centralized database and tracking system for intramural inventions Air Force-wide.

Example of Technologies Developed

As one example of a commercially successful invention, Air Force officials cited their creation of a less costly and more environmentally friendly system for removing snow from airplanes. In the past, ethylene glycol and propylene glycol were used to de-ice airplanes. However, after being sprayed onto aircraft, these chemicals typically escape onto the pavement, where they can contaminate streams and ground water. Consequently, the Environmental Protection Agency established limits for these materials in surface water, and airports must employ costly procedures to retain and dispose of the glycol runoff. The snow removal system developed by the Air Force uses compressed air to blow snow and unattached ice off airplane wings. It then puts a thin film of heated glycol on the cleaned wing to melt any residual ice. The new, forced-air technology often cleans a wing in a single step without using any glycol and, even when glycol is

[2] Fees for maintaining in force a patent based on an application filed on or after December 12, 1980.

required, the amount needed can be 70-90 percent less than when heated glycol alone is used. The Air Force estimates that its invention can save $21,000-$27,000 per plane over the previous method.

Department of the Army

The Department of the Army's mission is to organize, train, and equip its forces to fight and win the nation's wars and achieve directed national objectives. In this regard, the Army has a multi-billion dollar research and development program that involves varied research efforts to improve defensive and offensive capabilities. These efforts include developing new materials, equipment, and systems to enhance the Army's military capabilities.

Research

In fiscal year 2001, the Army obligated $5.3 billion for research and development, with $204.3 million, or 3.8 percent, for basic research; $639.0 million or 12.0 percent, for applied research; and $4.5 billion, or 84.1 percent, for development. The bulk of this funding went to contractors and grantees, with $3.2 billion, or 60.9 percent, for extramural projects and $2.1 billion, or 39.1 percent, for intramural projects.

Technology Transfer

Army officials said that their technology transfer activities are intended to work in synergy with U.S. industry to strengthen the military and the nation's economy. The Army recognized that a common military and private sector production base increases military strength and bolsters the private sector economy. Thus, the technology transfer program began with transferring "spin-off" technology from military research to private industry. It has evolved to include "dual-use" and "spin-on" technology to transfer technology between the military and the private sector. Some Army officials believe that licensing Army technology to private industry results in economies of scale that will decrease the Army's procurement costs.

The Army's technology transfer function is decentralized in that there is no one group or office that oversees intellectual property. Rather, each command is responsible for managing the property it has created. The Domestic Technology Transfer Program Office, under the Deputy Assistant Secretary of the Army for Research Technology, provides interpretation of DOD technology transfer regulations and issues additional policy guidance to the field as necessary. The Army has also designated an Intellectual Property Counsel to provide supervision, guidance and assistance in intellectual property matters.

The Army has established an Office of Research Technology Applications at 43 Army research facilities. Office of Research Technology Applications personnel, in addition to other duties, market and commercialize Army inventions. The Army also has patent counsels located at 13 facilities. The patent counsels provide guidance on the patentability of inventions, prepare and file patent applications, and provide legal assistance in preparation of patent license agreements. Office of Research Technology Applications personnel and the patent counsels can negotiate license agreements. Each command or facility is responsible for monitoring and tracking its own inventions, patents, and license agreements. There is no centralized database at the service level. Thus, if the Army wishes to develop statistics on technology transfer, it must query the individual Office of Research Technology Applications and patent counsels.

Twelve Army research units reported technology transfer activities during fiscal year 2001, but they differed significantly in the level of these activities. Three units, for example, accounted for 81.8 percent of the $845,472 in licensing income the Army received in fiscal year 2001. The Corps of Engineers' Humphreys Engineer Center was by far the largest, accounting for 47.2 percent of all licensing income, followed by the Armament Research, Development and Engineering Center with 21.3 percent and the Army Medical Research and Materiel Command with 13.4 percent.

Examples of Technologies Developed

Army officials pointed to several technologies they viewed as successful. For example, researchers at the Engineer Research and Development Center have developed a concrete armor unit that can reduce the cost of breakwater construction by nearly half. This invention has been patented and trademarked in the United States and foreign countries. The Army has awarded multiple licenses for the technology, which is gaining acceptance in the coastal engineering community.

The Army Research Laboratory developed a new ceramic material with both military and commercial applications. This ferro-electric ceramic material should increase communications capabilities and reduce cost. One of the applications includes low-cost tunable scanning antennas for communications satellites. The Army licensed the patents that are the heart of this ceramic material technology to a private company. The company has since grown from 4 to 90 employees and has developed the technology for use in areas such as cell phones and direct satellite communications systems. Army officials expect the technology to attract $8 million in private research and development funds in research areas of

direct interest to the Army and also anticipate substantial royalty income. They also believe that the licensing will lead to dual-use production that will benefit the civilian and military sectors in the area of broadband wireless communications.

Researchers at the Army's Edgewood Chemical Biological Center invented, developed, and patented a new method for detecting, measuring, and identifying viruses and nanoparticles in near real time. Using this technology, viruses can be counted and identified using only physical properties without the use of complicated chemistry or reagents. The Army expects the technology to be useful in developing new products such as vaccines. In addition, the technology may help researchers develop a wide range of materials such as paints, coatings, and transparent films. This technology could benefit the computer industry by leading to more complex devices with improved nanometer-sized separations and tolerances. According to the Army, commercialization of this new technology may result in $200 million in new instrumentation, enhance scientific advancement, and increase our understanding of viruses.

Department of Energy

The Department of Energy (DOE) manages the government's energy-related research and development efforts and oversees a large portion of its scientific and technological infrastructure. DOE's five-fold mission is to (1) foster a secure and reliable energy system that is environmentally and economically sustainable; (2) be a responsible steward of the nation's nuclear weapons; (3) clean up DOE's nuclear facilities; (4) lead in the physical sciences and advance the biological, environmental, and computational sciences; and (5) provide premier scientific instruments for the nation's research enterprise.

Research

Research and development are at the heart of DOE's mission. In fiscal year 2001, DOE obligated a total of $6.8 billion dollars for research and development with $2.4 billion, or 35.1 percent, for basic research; $2.1 billion, or 31.5 percent, for applied research; and $2.3 billion, or 33.4 percent, for development. Extramural research—mostly conducted by DOE's government-owned, contractor-operated laboratories—accounted for $5.9 billion, or 87.2 percent, of the total research budget, while intramural research accounted for $871.0 million, or 12.8 percent.

Technology Transfer

Recognizing that its scientific advances must be paired with effective technology transfer mechanisms, DOE has authorized 24 of its facilities to

engage in technology partnering activities such as licensing arrangements; CRADAs; and the development, transfer, and exploitation of federally owned or originated technology. In addition, DOE administers a number of programs aimed at advancing science through accelerating and ensuring the widespread use of new technologies. For example:

- Within the Office of Environmental Management, the Office of Technology Applications facilitates the application of new technologies, processes, and knowledge to environmental management problems and develops initiatives, policies, and procedures that unite end users, regulators, stakeholders, technology vendors, and technology developers.

- The Office of Energy Efficiency and Renewable Energy's Office of Industrial Technologies strives to deliver advanced energy technology through partnerships with industry, government, and non-governmental organizations.

- The Office of Science's Laboratory Technology Research program focuses on establishing cost-shared partnerships with the private sector.

- DOE offers a number of programs that promote small business's role in the development and commercialization of federally funded technologies.

As shown in table 1 of appendix IV, DOE had more invention disclosures, patent applications, patents issued, patents in force, licenses executed, licenses in force, and licenses earning income in fiscal year 2001 than any of the eight other agencies included in our review. Also, DOE was second only to NIH in licensing income, with $21.4 million received during the fiscal year.

Most of the inventions produced from DOE funds are developed at DOE's contractor-operated facilities. In fiscal year 2001, for example, contractor-operated facilities obtained patents for approximately 540 inventions and received about $21 million in licensing royalties. According to a DOE official, some inventions developed at contractor-operated facilities are exempt from patenting since they include technologies—such as those involving nuclear reactors—that cannot be made available to the public. For various reasons, DOE contractors on occasion choose not to apply for patents on the technologies they have created. When this happens, DOE can elect to retain title to the invention and to apply for a patent. If DOE elects not to pursue a patent, it may be possible for the inventor to file a patent application in his or her own name. In any event, the technology is also frequently published in the scientific literature.

DOE officials said that they produce relatively few inventions in the laboratories DOE itself operates. In addition, they said that the inventions that are created in DOE laboratories involve technologies that are not easily commercialized.

All DOE sites, regardless of their intramural or extramural status, submit invention disclosure information to DOE through an automated data system. The system tracks the status of each invention and has the capability of providing a complete record of the invention's status. Licensing activities are concentrated in the individual laboratories, and the contractors have the responsibility for attempting commercialization of their DOE-funded inventions. DOE itself does not normally become involved in the licensing negotiations nor does it maintain statistics on specific licenses executed by the individual laboratories.

DOE's licenses cover various types of property, with patents accounting for 55.4 percent, copyrights accounting for 38.4 percent, and other properties, accounting for 6.2 percent of licenses executed in fiscal year 2001. Most licenses are nonexclusive, accounting for 85.2 percent of the licenses executed in fiscal year 2001.

Examples of Technologies Developed

DOE facilities have produced and successfully transferred many inventions DOE believes have technical significance, uniqueness, and promise of real-world application. For example, one invention based on DOE-funded research, the CombiSep MCE 2000, is poised to become a leading chemical separation instrument. This invention employs multiplexed capillary electrophoresis using absorption detection to rapidly separate samples of complex chemical or biochemical mixture.[3] It has the ability to decipher an individual's entire genetic code faster, more accurately, and less expensively than conventional instrumentation. The director of Ames Laboratory's Chemical and Biological Sciences Program developed the multiplexed capillary electrophoresis technology and subsequently helped establish a start-up company to turn his discoveries into a commercial instrument. Within 9 months, the company had designed, tested, and sold the first instrument.

[3]Capillary electrophoresis involves the use of an electrical current that causes the molecules in the sample under investigation to migrate at different speeds, according to size and charge.

Technologies related to a new catalyst for fuel cell development have also been transferred successfully. Developed at DOE's Argonne National Laboratory, the new fuel cell technology is the key component of a fuel processor that efficiently converts methanol, ethanol, natural gas, gasoline, and diesel into hydrogen that can be fed to a fuel cell to produce electricity. This fuel flexibility, a shorter startup time, and lower operating temperatures will help make fuel-cell-powered automobiles practical and may accelerate bringing ultra-efficient, environmentally friendly electric cars into the marketplace. The technology will be manufactured and distributed under a licensing agreement between the Argonne National Laboratory and a private company.

National Aeronautics and Space Administration

The National Aeronautics and Space Administration (NASA) was created to undertake civilian research, development, and flight activities in aeronautics and space to maintain the country's preeminence in those areas. NASA conducts its research through laboratories in headquarters, nine field installations, and the Jet Propulsion Laboratory—the agency's only government-owned, contractor-operated facility—operated by the California Institute of Technology.

Research

In fiscal year 2001, NASA obligated $9.6 billion for research and development, with $1.9 billion, or 19.8 percent, for basic research; $2.8 billion, or 29.2 percent, for applied research; and $4.9 billion, or 51 percent, for development. NASA obligated $7.1 billion, or 74 percent, for extramural research and $2.5 billion, or 26 percent, for intramural research.

Technology Transfer

NASA has both an intellectual property program and a commercial technology program. NASA's Office of General Counsel administers its intellectual property program. The office develops policy and establishes operations necessary to protect, maintain, license, use, and dispose of intellectual property rights in inventions, discoveries, innovations, writings, etc. that are created, acquired or used in the performance of NASA programs. The program is intended to (1) stimulate the creation, identification, and use of new technology in NASA programs; (2) foster the widest practical and appropriate dissemination and commercial utilization of new technology arising out of agency programs; (3) protect the government's interests in intellectual property; (4) respect private interests in intellectual property; and (5) recognize and reward innovation.

NASA's commercial technology program, which is a part of the Office of Aerospace Technology, includes commercial programs, technology transfer agents, and the Small Business Innovation Research Program. The purpose of the commercial programs is to share the harvest of NASA's technology program with the U.S. industrial and scientific community. The technology transfer agents facilitate the transfer of NASA and other federally sponsored research and technology to the U.S. private sector for commercial application, thereby enhancing U.S. industrial growth and economic competitiveness. The goal of NASA's Small Business Innovation Research Program is to promote the widest possible award of NASA research contracts to the small business community as well as to promote commercialization of the results of this research by the small business community.

NASA uses its TechTracS data system for monitoring and tracking intramural inventions. Invention disclosures are sent to the Office of Patent Counsel, where decisions are made about whether patent applications should be filed. If a patent application is filed, commercial program personnel are tasked with the marketing effort. Commercialization efforts are varied. New technologies are featured on NASA's website. On occasion, NASA uses direct marketing through email. Also, inventors may provide leads to technology transfer professionals who, in turn, contact industry associates to inform them of new inventions.

Like other contractors working on federally sponsored research, the California Institute of Technology has the first option to retain title to inventions developed at the Jet Propulsion Laboratory and is entitled to receive 100 percent of the royalties from patent licenses. However, NASA is entitled to patent any inventions that the California Institute of Technology declines and has assigned a patent counsel to its management office at the Jet Propulsion Laboratory to handle these inventions.

Many of NASA's licenses have some degree of exclusivity because of the amount of money that is normally required to bring one of NASA's inventions to market. NASA officials said that venture capitalists often require some exclusivity in order to loan money to the licensees. Normally there is not a lot of competition in licensing. If more than one party wants to license the same technology, NASA will usually try to license it to both parties and divide it by the field of use. About 95 percent of NASA's licenses are issued to small businesses.

NASA shares its licensing income with the inventors. In addition to an award of $500 when a regular patent application is filed, an inventor receives the first $5,000 of the royalties collected and 25 percent of the balance accumulated each fiscal year under each license. However, no one inventor can receive more than $150,000 per calendar year without presidential approval. A slightly different formula is used if there is more than one inventor.

Examples of Technologies Developed

In order to maintain awareness of successful transfer and application of technology by industry and the public, NASA compiles "success stories" showing examples of how its technology is utilized. In one such example, NASA researchers at the Langley Research Center developed a method of producing two distinct wavelengths from a single laser. The technology was discovered and developed in support of one of the agency's remote sensing programs as a method of measuring the wind speed or the density of atmospheric constituents. In the past, applications that demanded more than one wavelength required building a system with multiple laser cavities, which greatly increased the cost and complexity of a laser device. When officials from a New Jersey start-up company learned of the invention, they believed it could be used to develop a dental laser that would break the price barrier that has kept painless laser dentistry out of reach for most dentists and their patients. A company scientist will be working to refine the inventions in the NASA Langley Research Center Laboratory. The goal of this work is to produce the two specific wavelengths that have been approved by the FDA for use in dentistry. One of these wavelengths is effective on hard tissue, such as teeth, and will replace the dentist's drill. The other wavelength is effective on soft tissue, such as gums, and will replace the scalpel for gum surgery.

As a second example, NASA scientists at the Marshall Space Flight Center developed Video Image Stabilization and Registration, a system that improves the clarity of video footage by correcting distortion caused by adverse conditions. A video processing algorithm is used to co-align video image fields by analyzing the picture pixel and removing the effects of translation, magnification, and rotation. The system was successfully used to assist the FBI in analyzing video footage of the deadly 1996 Olympic Summer Games bombing in Atlanta, Georgia. An Alabama company has employed this technology to develop its trademark Video Analyst System, which offers broadcast-quality analysis features on Intel-based hardware. Several law enforcement organizations have purchased the system. It also can be used in tollbooths, airports, and emergency vehicles. The military can use this technology for intelligence, surveillance, and reconnaissance.

The National Institutes of Health

The National Institutes of Health (NIH) cites its mission as "science in pursuit of fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to extend healthy life and reduce the burdens of illness and disability." In this regard, NIH seeks to (1) foster fundamental creative discoveries, innovative research strategies, and their applications as a basis to advance significantly the nation's capacity to protect and improve health; (2) develop, maintain, and renew scientific human and physical resources that will assure the nation's capability to prevent disease;
(3) expand the knowledge base in biomedical and associated sciences to enhance the nation's economic well-being and ensure a continued high return on the public investment in research; and (4) exemplify and promote the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science.

Research

NIH conducts and supports research in the causes, diagnosis, prevention, and cure of human diseases; in the processes of human growth and development; in the biological effects of environmental contaminants; in the understanding of mental, addictive and physical disorders; and in directing programs for the collection, dissemination, and exchange of information in medicine and health, including the development and support of medical libraries and the training of medical librarians and other health information specialists. In fiscal year 2001, NIH obligated $17.9 billion for research and development, with $10.4 billion, or 58.1 percent, for basic research; $5.1 billion, or 28.6 percent, for applied research; and $2.4 billion, or 13.2 percent, for development. Most of the budget went to contractors and grantees, with $14.8 billion, or 82.8 percent, obligated for extramural research and $3.1 billion, or 17.2 percent, obligated for intramural research. NIH conducts and sponsors its intramural research through 27 institutes and centers devoted to diverse areas of public health.

Technology Transfer

As both a sponsor of and participant in biomedical research, NIH is an aggressive proponent of technology transfer, noting that it "has a dual interest in accelerating scientific discovery and facilitating product development." NIH's technology transfer program for intramural research has both decentralized and centralized features. For example the agency has centralized, within the OTT in the Office of the Director, the coordination of all policies affecting technology transfer and intellectual property matter, including the review of all proposed CRADAs. The agency has decentralized activities regarding the development and

implementation of CRADAs, Clinical Trial Agreements, and Material Transfer Agreements, however, by assigning these to the institutes and centers. The individual institutes and centers are responsible for advising their staff on technology transfer issues and assisting them in determining when to disclose new technology by filing Employee Invention Reports. The institutes and centers also provide the OTT with their views on proposed patenting and licensing strategies and the authorization of institute or center funds to pursue patenting activities through the OTT. The OTT is funded through a special budget review process and funds authorized are provided on a formula basis from each institute and center that uses OTT services.

OTT has developed its own automated tracking system for monitoring technology transfer activities for NIH's intramural research programs. This system is separate from the iEdison system NIH uses for the reporting of inventions under its extramural research programs. NIH officials said that the intramural monitoring system is becoming outdated and that they plan to replace it with NIH TechTracS, an invention tracking system initially developed by NASA. After significant modification by NIH staff, the new system will be the official NIH technology transfer data system for fiscal year 2003 technology transfer activities.

NIH consistently leads all federal agencies in licensing income. As shown in table 1 of appendix IV, NIH received $46.1 million in income during fiscal year 2001, or 61.9 percent of the income received by all 9 agencies we reviewed. NIH had more than twice the income received by DOE, the second largest agency in terms of income, and more than 17 times the income received by ARS, the third largest. Licensing income varied widely among NIH's 27 institutes and centers, with three institutes—the National Cancer Institute, the National Institute for Allergy and Infectious Diseases, and the National Heart, Lung, and Blood Institute—accounting for the vast majority of revenues.

NIH receives licensing income from a variety of sources. The largest is earned income based on the royalty schedules in the licensing agreements. Other sources of income include "execution" fees charged licensees upon entering the licensing agreements, "minimum annual" fees required of licensees for remaining in their agreements with NIH, and reimbursements by the licensees for NIH's costs of obtaining patents.

NIH officials said that the agency has become more selective in the inventions they choose to patent. In this regard, they follow the Public Health Services Technology Transfer Policy Manual, which provides that

patents on biomedical technologies should be sought only when a patent would facilitate the availability of the technology to the public for preventive, diagnostic, therapeutic, or research use or other commercial use. Some institutes and centers have internal review groups that provide opinions as to whether particular technologies should be patented. In addition, the OTT conducts a detailed evaluation of each technology and provides the information to the institute or center with a recommendation. Ultimately, however, the decision on whether to spend an institute's or center's funds to support the patenting of a particular technology is the responsibility of the institute or center. Even if the decision is not to patent, NIH may seek to transfer the technology through other mechanisms. For example, if the invention would be informative to those engaged in research or otherwise beneficial to the public health but probably would not have a sufficient commercial appeal, NIH might simply give notice through publication. If the invention was a biological material that had commercial appeal that would last for a relatively short time, NIH might license it without seeking a patent. Patenting would be reserved for inventions that require further research and development to protect a substantial investment to be made by the licensee. In fiscal year 2001, 149 of the 200 licenses NIH executed were based on patented inventions and the other 51 were based on nonpatented biological materials.

NIH officials said that it is NIH's policy to pursue nonexclusive or co-exclusive licenses whenever possible. This allows more than one company to develop products that use the same technology and may ultimately compete with each other in the marketplace. They noted that this practice is consistent with the agency's objective of disseminating the results of its research as widely as possible and fostering competition. For fiscal year 2001, NIH executed 153 nonexclusive, 44 exclusive, and 3 partially exclusive licenses among the 200 licenses the agency executed in total.

The OTT has designated staff responsible for billing for royalties due and reviewing income reports to ensure that licensees are paying the appropriate amounts. When inconsistencies are found, the matter is referred to OTT's Audit and Infringement group for resolution. In addition, the Audit and Infringement group—which currently consists of two persons—reviews audit reports that are submitted to the OTT in accordance with license requirements and requests audits when necessary to resolve questions regarding the payments the licensees make to NIH. OTT contracts for these audits with private firms, with the costs borne by the institute or center that is a party to the license.

Examples of Technologies Developed

NIH has numerous technologies that have been successful in the diagnosis and treatment of diseases and other medical conditions. For example:

- Magnetic Resonance Imaging is a very popular non-invasive technique in the radiologist's toolkit. However, it suffers from many limitations, including insufficient resolution and the difficulty of obtaining real-time pictures. Recent developments such as saturation transfer techniques, which were developed at the NIH, have dramatically improved both the spatial and temporal resolution of Magnetic Resonance Imaging pictures. In saturation transfer, the exchange of protons between tissue molecules and the water that surrounds them is examined. Such measurements provide a wealth of information that can then be analyzed for many different parameters including tissue structure, motion, and viability. A number of major manufacturers have made magnetization transfer a standard feature on Magnetic Resonance Imaging machines, thus providing the users with the ability to push forward the diagnostic utility of this technology.

- Licensed non-exclusively to a large number of companies, the NIH-developed AIDS test kit can be credited with single-handedly increasing the safety of the human blood supply and bringing about sharp declines in AIDS cases due to blood transfusion. The original patent dealt with the isolation, purification, characterization and scale-up of HIV, the causative agent of AIDS. The potential of these discoveries were very quickly realized with the rapid development of a blood test for AIDS. NIH hopes that this patent, which describes the structure and properties of HIV, will one day also lead to the development of effective vaccines that can prevent the spread of this deadly scourge.

- Hepatitis A is probably the most widespread of viral hepatitis diseases, and is endemic among the children of underdeveloped countries. NIH scientists were the first to develop a strain of this virus, HM-175, which could be grown in cell culture. This opened a totally new way to understand and halt the spread of this disease. The technology itself has been non-exclusively licensed to GlaxoSmithKline, which has successfully developed and commercialized a vaccine for this disease.

National Oceanic and Atmospheric Administration

The National Oceanic and Atmospheric Administration (NOAA) is an agency of the Department of Commerce. Its mission is to describe and predict changes in the Earth's environment and conserve and manage the nation's coastal and marine resources.

Research

NOAA conducts research primarily through the Office of Oceanic and Atmospheric Research, which focuses on enhancing our understanding of environmental phenomena such as tornadoes, hurricanes, climate variability, solar flares, changes in the ozone, El Nino/La Nina events, fisheries productivity, ocean currents, deep sea thermal vents, and coastal ecosystem health. NOAA has about 50 laboratories nationwide, with 12 of these in the Office of Oceanic and Atmospheric Research's network.

In fiscal year 2001, NOAA obligated a total of $591.2 million for research and development, of which $5.2 million, or 0.9 percent, was for basic research; $562.9 million, or 95.2 percent, was for applied research; and $23.1 million, or 3.9 percent, was for development. Most of this funding went to NOAA's own researchers, with $505.2 million, or 85.5 percent, obligated for intramural research and $86.0 million, or 14.5 percent, obligated for extramural research.

Technology Transfer

NOAA does not have a large technology transfer program, ranking ninth among the nine agencies we surveyed in every category of measurable output in fiscal year 2001. As shown in table 1 of appendix IV, NOAA disclosed 2 inventions, applied for 3 patents, was issued 1 patent, and had 10 patents in force. None of these applications or patents was foreign. Similarly, NOAA executed only one license and had only one license in force in fiscal year 2001. That license was exclusive, was with a domestic licensee, and was based on a patent. The patent on which the license is based will expire in 3 years. Total licensing income was $1,500 during the fiscal year.

NOAA's technology transfer office is the Office of Research and Technology Applications within the Office of Oceanic and Atmospheric Research. One NOAA official is assigned to the task of technology transfer on a part-time basis, with the remainder of his time devoted to the Small Business Innovation Research Program, a far larger program at NOAA.[4] NOAA officials said that the agency's technology does not easily lend itself to marketable inventions and that this was the main reason they did not have more licenses. They also acknowledged, however, that the agency needed to be more aggressive in identifying technologies that could be developed and licensed and is looking for ways to improve its technology transfer program. They said that this would require a larger staff, more

[4] NOAA is in the process of hiring a full time employee.

funds, more training, and a new commitment on the part of the laboratories.

NOAA's technology transfer policy is explained in an administrative order. Among other things, the order contains the procedures for disclosing, patenting, and licensing an invention. NOAA has also taken a number of steps to educate and inform its scientists on technology transfer and CRADAs.

When a NOAA employee creates new technology, the inventor is responsible for preparing and forwarding an invention disclosure statement and a completed questionnaire to the appropriate laboratory director. The NOAA laboratory director forwards the invention disclosure statement and questionnaire to the Department of Commerce Patent Counsel with (1) a recommendation on whether the Department of Commerce should pursue a patent and (2) a statement indicating whether the laboratory will negotiate a license on the invention if a patent application is filed. The Department of Commerce Patent Counsel initiates the filing of any patent application and handles any licenses. The individual NOAA laboratories are responsible for any costs associated with the patent application process and fees for invention management services. The laboratories are also responsible for marketing the inventions. NOAA inventors receive at least 30 percent of the royalties or other income from their inventions.

NOAA officials said that, in the past, the laboratories have varied in deciding what to do with their inventions. Sometimes they published their research and did not pursue a patent. In other cases, they simply provided the information to those who needed it without bothering to get a patent or a license. The officials said that there usually is little interest in trying to market NOAA inventions because they seldom have commercial appeal. They also said that NOAA laboratories cite the high cost of obtaining patents as a major obstacle to patenting their technologies.

Examples of Technologies Developed

One of NOAA's more successful inventions involved a method for producing fishmeal from fish processing waste. Employees at one of NOAA's laboratories initiated the research project after a fishmeal producer asked for assistance in modifying fishmeal to meet the minimum specifications required by the animal feed industry. The researchers then developed a new technique for producing high-quality fishmeal by adapting equipment used to remove seeds from fruit and vegetables. Although this technique was not patented, two companies have

subsequently incorporated the new technology into their processes. The technique is considered a success because it results in the production of fishmeal that has a higher nutritive and economic value while at the same time increasing the utilization of marine fisheries resources. Also, NOAA officials said that the invention helped to reduce unemployment in two villages.

NOAA's only active license is for an acoustic scintillation liquid flow measurement system. The technology can be used in dams, hydroelectric plants, ports, harbors, and irrigation canals. NOAA licensed the invention to the Canadian Ministry of Fisheries and Oceans, which, in turn, licensed it to a Canadian company. The co-inventor works for the Ministry of Fisheries and was instrumental in locating the company that licensed the technology after no U.S. firms responded to NOAA's notice in the Federal Register that the technology was available for licensing.

Department of the Navy

The Department of the Navy's mission is to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. To support its efforts, the Navy has a multi-billion dollar research and development program aimed at improving the defensive and offensive capabilities of air, surface, and undersea weapons systems.

Research

The Navy's research efforts include developing new materials, equipment, and systems to enhance the Navy's military capabilities. The Navy also conducts biomedical research to enhance the health, safety, performance and readiness of military personnel. In fiscal year 2001, the Navy obligated a total of $8.7 billion for research and development, with $396.1 million, or 4.5 percent, for basic research; $532.8 million, or 6.1 percent, for applied research; and $7.8 billion, or 89.4 percent, for development. Of this funding, $5.4 billion, or 61.9 percent, was obligated for extramural projects and $3.3 billion, or 38.2 percent, was obligated for intramural projects.

Technology Transfer

The Navy's technology transfer program for intramural research is, for the most part, decentralized. The Navy's Office of Naval Research is responsible for the supervision, administration, and control of activities related to patents, inventions, trademarks, copyrights, and royalty payments. However, the Navy's invention disclosure, patenting, and licensing activities are decentralized within the local facilities or commands performing these tasks. Aside from the Office of Naval

Research, there are 17 Navy offices or facilities that have assigned patent counsels. Each Navy facility monitors its own invention disclosures, determines what technologies will be patented, and pays for these activities with its own funds. Technology transfer personnel at the facilities, assisted by local patent counsel, are responsible for marketing the inventions, negotiating licenses, and executing the license agreements. Royalty payments are centralized in that all license royalty payments are sent to the Office of Naval Research's Patent Counsel for processing.

The Office of Naval Research has developed its own automated reporting and tracking system for monitoring technology transfer activities for its intramural research programs. This system is known as the Intellectual Property Management Information System and includes such information as the name of the reporting office, the inventor's name, the title of the invention, the invention abstract, the name of the assigned attorney, the dates on which invention evaluations are due and dates they are completed, authorization status of the invention, and information on patent filing and prosecution. The Intellectual Property Management Information System is evolving, and it may eventually have additional modules for reporting patent grants and trademarks. The Navy plans to move the Intellectual Property Management Information System data to a web-based mode and the system may become a DOD-wide system. The Air Force has agreed to use the Intellectual Property Management Information System and the Army has indicated that it favors signing on to this system.

As shown in table 1 of appendix IV, the Navy collected $1.2 million in royalties in fiscal year 2001. Three Navy sites accounted for 79.1 percent of this income. The Naval Research Laboratory was by far the largest, accounting for 56.2 percent of all licensing income, followed by the Naval Medical Research Center with 12.6 percent, and one of the Naval Surface Warfare Centers with 10.2 percent.

Navy officials said that decisions to patent often are defensive decisions, rather than decisions based on the likelihood of commercialization. In this regard, the Navy may obtain a patent merely to ensure that it controls technology that could have a part in the nation's defense mission. Navy officials said that patenting and licensing inventions also helps the Navy meet its mandate to facilitate technology transfer and that commercialization of Navy inventions provides for increased production for the civilian market and reduces the unit cost of military procurement.

The decision on whether to obtain a patent on an invention is made at the facility where the invention was created. In addition to the need to patent

to protect the technology for the Navy's own possible use in the future, Navy personnel consider such factors as the military and consumer market for the invention, the amount of additional research that would be needed to develop the invention, the invention's likely cost and performance in the marketplace compared to alternative products, the invention's technical merit, and the interest expressed by potential licensees.

Examples of Technologies Developed

The Navy has produced some successful inventions in its facilities. For example, researchers at the Naval Undersea Warfare Center developed a digital image enhancement technology to better identify small objects, such as mines, in a cluttered underwater environment. Believing that this technology also might be used to assist physicians looking for microcalcifications in a mammogram, the Navy signed a license agreement with a company to transfer the Navy undersea mine hunting technology to the public medical arena. Navy officials believe the digital image enhancement will increase success in detecting early-stage breast cancer and save thousands of lives.

As another example, the Naval Research Laboratory developed an environmentally safe anti-biofouling coating system for ship hulls and pipeline applications. The coating system provides a surface to which organisms such as barnacles, mussels, and algae find it hard to adhere. This anti-fouling action is accomplished without using metals and other chemicals that may be harmful to aquatic life and humans. The coating system has been licensed and is marketed for use on commercial and government-owned ship hulls and power plant water intake systems. The Navy estimates that the electric power industry will save up to $5 billion a year in reduced costs to clean water intake pipes. In addition, use by the fishing industry will reduce the loss of line, nets and other equipment due to biofouling.

U.S. Geological Survey

The U.S. Geological Survey (USGS) is the major science agency for the Department of the Interior. Its mission is to provide reliable scientific information to describe and understand the earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

Research

In fiscal year 2001, USGS obligated a total of $553.8 million dollars for research and development, of which $55.4 million, or 10 percent, was for basic research; $463.8 million, or 83.7 percent, was for applied research;

and $34.6 million, or 6.2 percent, was for development. The vast majority of the total research funding was for in-house activities, with $517 million, or 93.4 percent, obligated for intramural research and $36.8 million, or 6.6 percent, obligated for extramural research.

Technology Transfer

USGS produces few inventions as a byproduct of its research. As shown in table 1 of appendix IV, for example, USGS disclosed only four new inventions, received four patents, and executed two licenses—both nonexclusive—during fiscal year 2001. One of the licensees agreed to pay a limited annual fee pending the company's demonstrated ability to develop the technology. Total licensing income for the fiscal year was $220,000, ranking USGS seventh among the nine agencies included in our review. Of this amount, $20,000 was directly attributable to current licenses and $200,000 was received as final partial year payments on a recently expired reverse osmosis patent.

USGS is in the process of reorganizing its technology transfer program. The reorganization is part of a larger effort based on the agency's adoption of a decentralized integrated science approach.

Currently, USGS uses several products and separate systems to track products and their budgets. In fiscal year 2003, it plans to adopt a centralized web-based system for project planning and budgeting. In April 2002, USGS and the Navy signed a Memorandum of Understanding that provides for Navy patent counsel to apply for patents on behalf of USGS. The objective of the consolidation is to streamline USGS's invention disclosure and the patent application process and reduce duplicative costs. USGS's Technology Transfer Office handles licensing activities for USGS and several sister agencies within the Department of the Interior.

Inventors are entitled to a minimum of 33 percent of the royalties from their inventions. They receive the first $2,000 in royalties and have a maximum royalty cap of $150,000 per year. When the patent application is filed, the inventor is awarded $500. The inventor receives an additional $800 after the patent is issued.

Although its license agreements contain a provision allowing USGS to audit a licensee's records to ensure that the licensee is paying the proper amount of royalties, the agency has no staff, funds, or formal process for monitoring its licensees. On one occasion, USGS received an allegation that one of its licensees was not reporting the proper amount of royalty income. It turned the matter over to its Office of Inspector General, which

eventually asked the Department of Justice to intervene. The matter is still in litigation.

Examples of Technologies Developed

USGS has developed several successful technologies. Under a cooperative agreement with the National Stone and Gravel Association, USGS developed software containing maps and other data. This software was used to rescue nine people who were trapped in a mine in Pennsylvania in July 2002. The product is being marketed by a collaborator, and USGS will receive a portion of the income from the sales.

USGS is currently engaged in a series of field test demonstrations aimed at improving the real-time water quality information available to coastal community water departments. The USGS technology, termed "robo-well," is capable of continually monitoring the ground or surface water source for predetermined contaminants. Furthermore, the technology can be preprogrammed to send alert messages to a centralized location when established contaminant parameters are exceeded. Although the current Environmental Protection Agency standards for monitoring contaminants are only periodic rather than continual, the USGS technology is developing a niche in the drinking water community. The technology is on-line or being installed in two Massachusetts water departments and has one commercial licensee.

Appendix IV: Invention Disclosure, Patenting, and Licensing Statistics for Nine Selected Federal Agencies, Fiscal Years 1997-2001

Table 1: Invention, Patenting, and Licensing Statistics by Agency for Fiscal Year 2001

	Agency									
Activity	**ARS**	**Air Force**	**Army**	**DOE**	**NASA**	**NIH**	**NOAA**	**Navy**	**USGS**	**Total**
Invention disclosures	118	139	270	1,479	696	379	2	589	4	**3,676**
Patent applications										
U.S.	96	118	272	933	285	174	3	394	16	**2,291**
Foreign	22	0	71	184	17	156	0	57	0	**507**
Total	**118**	**118**	**343**	**1,126**[a]	**302**	**330**	**3**	**451**	**16**	**2,807**[a]
Patents issued										
U.S.	64	114	161	545	152	99	1	327	4	**1,467**
Foreign	12	0	3	41	7	46	0	9	0	**118**
Total	**76**	**114**	**164**	**586**	**159**	**145**	**1**	**336**	**4**	**1,585**
Patents in force[b]										
U.S.	619	2,344[c]	1,130	4,769	1,302	1,383	10	2,295	42	**13,894**
Foreign	[d]	0	10	450	66	641	0	29	0	**1,196**
Total	**619**[d]	**2,344**[c]	**1,140**	**5,219**	**1,368**	**2,024**	**10**	**2,324**	**42**	**15,090**
Licenses in force[b]										
U.S.	[e]	63	89	1,866	[e]	1,152[f]	1	99	6	**3,276**
Foreign	[e]	0	12	272	[e]	205[f]	0	7	0	**496**
Undetermined	245	0	0	0	269	0	0	0	0	**514**
Total	**245**	**63**	**101**	**2,138**	**269**	**1,357**[f]	**1**	**106**	**6**	**4,286**
Licenses executed by type of license										
Exclusive	21	8	8	48	12	44	1	6	0	**148**
Partially exclusive	7	0	0	32	4	3	0	6	0	**52**
Nonexclusive	3	7	6	497	23	153	0	13	2	**704**
Other	0	2	0	6	7	0	0	1	0	**16**
Total	**31**	**17**	**14**	**583**	**46**	**200**	**1**	**26**	**2**	**920**
Licenses executed by type of property										
Patent	31	17	56	304	38	149	1	26	2	**624**
Research materials	0	0	0	0	0	51	0	0	0	**51**
Other	0	0	0	245[g]	8	0	0	0	0	**253**
Total	**31**	**17**	**56**	**549**	**46**	**200**	**1**	**26**	**2**	**928**
Licenses earning income during fiscal year	120	12	28	992	114	697	1	87	5	**2,056**
Licensing income (in thousands)	$2,622.0	$99.0	$845.5	$21,387.5	$1,971.2	$46,100.0	$1.5	$1,245.6	$220.0	**$74,492.3**

Legend

ARS = Agricultural Research Service

DOE = Department of Energy

NASA = National Aeronautics and Space Administration

NIH = National Institutes of Health

NOAA = National Oceanic and Atmospheric Administration

USGS = United States Geological Survey

[a]Agency did not explain why total applications reported are greater than sum of U.S. and foreign applications reported.

[b]In force at the end of the fiscal year.

[c]The Air Force estimates that about 1,000 patents have fully paid-up maintenance fees.

[d]Foreign statistics were unavailable; total includes U.S. patents only.

[e]Data for U.S. and foreign licenses were not broken out.

[f]Estimate.

[g]Other includes 211 copyrights.

Source: Statistics provided by agencies listed.

Table 2: Invention, Patenting, and Licensing Activity by the Agricultural Research Service for Fiscal Years 1997-2001

	Fiscal year				
Activity	**1997**	**1998**	**1999**	**2000**	**2001**
Invention disclosures	130	104	122	109	118
Patent applications					
U.S.	56	64	113	107	96
Foreign	[a]	[a]	[a]	[a]	22
Total	**56**	**64**	**113**	**107**	**118**
Patents issued					
U.S.	35	57	74	64	64
Foreign	[a]	[a]	[a]	[a]	12
Total	**35**	**57**	**74**	**64**	**76**
Patents in force[b]					
U.S.	[a]	[a]	[a]	[a]	619
Foreign	[a]	[a]	[a]	[a]	[c]
Total	**[a]**	**[a]**	**[a]**	**[a]**	**619[c]**
Licenses in force[b]					
U.S.	[a]	[a]	[a]	[a]	[d]
Foreign	[a]	[a]	[a]	[a]	[d]
Undetermined					245[d]
Total	**[a]**	**[a]**	**[a]**	**[a]**	**245**
Licenses executed by type of license					
Exclusive	21	23	29	24	21
Partially exclusive	[a]	[a]	[a]	[a]	7
Nonexclusive	[a]	[a]	[a]	[a]	3
Other	[a]	[a]	[a]	[a]	0
Total	**21**	**23**	**29**	**24**	**31**
Licenses executed by type of property					
Patent	21	23	29	24	31
Research materials	[a]	[a]	[a]	[a]	0
Other	[a]	[a]	[a]	[a]	0
Total	**21**	**23**	**29**	**24**	**31**
Licenses earning income during fiscal year	[a]	[a]	[a]	[a]	120
Licensing income	[a]	[a]	[a]	[a]	$2,622,000

[a]Current database does not track these data for this year.

[b]In force at the end of the fiscal year.

[c]Foreign statistics were unavailable; total includes U.S. patents only.

[d]Data for U.S. and foreign licenses were not broken out.

Source: Agricultural Research Service.

Table 3: Invention, Patenting, and Licensing Activity by the Department of the Air Force for Fiscal Years 1997-2001

	Fiscal year				
Activity	**1997**	**1998**	**1999**	**2000**	**2001**
Invention disclosures	124[a]	125[a]	122	174	139
Patent applications					
U.S.	114	164	116	108	118
Foreign	1	0	0	0	0
Total	**115**	**164**	**116**	**108**	**118**
Patents issued					
U.S.	85	88	85	80	114
Foreign	0	0	0	0	0
Total	**85**	**88**	**85**	**80**	**114**
Patents in force[b]					
U.S.	2,472[c]	2,401[c]	2,362[c]	2,352[c]	2,344[c]
Foreign	0	0	0	0	0
Total	**2,472[c]**	**2,401[c]**	**2,362[c]**	**2,352[c]**	**2,344[c]**
Licenses in force[b]					
U.S.	28	38	43	48	63
Foreign	0	0	0	0	0
Total	**28**	**38**	**43**	**48**	**63**
Licenses executed by type of license					
Exclusive	2	3	3	3	8
Partially exclusive	0	0	0	0	0
Nonexclusive	4	7	3	3	7
Other	0	1	4	1	2
Total	**6**	**11**	**10**	**7**	**17**
Licenses executed by type of property					
Patent	6	11	10	7	17
Research materials	0	0	0	0	0
Other	0	0	0	0	0
Total	**6**	**11**	**10**	**7**	**17**
Licenses earning income during fiscal year	14	11	13	15	12
Licensing income	$190,000	$197,800	$156,000	$80,616	$99,038

[a]Estimate.

[b]In force at the end of the fiscal year.

[c]The Air Force estimates that about 1,000 patents have fully paid-up maintenance fees.

Source: U.S. Air Force.

Table 4: Invention, Patenting, and Licensing Activity by the Department of the Army for Fiscal Years 1997-2001

	Fiscal year				
Activity	**1997**	**1998**	**1999**	**2000**	**2001**
Invention disclosures	290	263	293	233	270
Patent applications					
U.S.	241	221	266	288	272
Foreign	46	43	58	64	71
Total	**287**	**264**	**324**	**352**	**343**
Patents issued					
U.S.	130	135	141	131	161
Foreign	0	1	4	4	3
Total	**130**	**136**	**145**	**135**	**164**
Patents in force[a]					
U.S.	1,032	1,089	1,094	1,115	1,130
Foreign	8	8	9	12	10
Total	**1,040**	**1,097**	**1,103**	**1,127**	**1,140**
Licenses in force[a]					
U.S.	68	73	75	82	89
Foreign	6	9	9	11	12
Total	**74**	**82**	**84**	**93**	**101**
Licenses executed by type of license					
Exclusive	7	7	6	8	8
Partially exclusive	6	2	1	1	0
Nonexclusive	9	6	6	8	6
Other	0	0	0	0	0
Total	**22**	**15**	**13**	**17**	**14**
Licenses executed by type of property					
Patent	51	48	47	52	56
Research materials	3	3	3	4	0
Other	0	0	0	0	0
Total	**54**	**51**	**50**	**56**	**56**
Licenses earning income during fiscal year	21	23	20	24	28
Licensing income	$273,235	$239,185	$244,315	$550,640	$845,472

Note: Table does not include data from one command.

[a]In force at the end of the fiscal year.

Source: U.S. Army.

Table 5: Invention, Patenting, and Licensing Activity by the Department of Energy for Fiscal Years 1997-2001

	Fiscal year				
Activity	**1997**	**1998**	**1999**	**2000**	**2001**
Invention disclosures	1,311	1,382	1,519	1,483	1,479
Patent applications					
U.S.	743	764	954	853	933
Foreign	234	244	229	228	184
Total	**986**[a]	**1,014**[a]	**1,192**[a]	**1,090**[a]	**1,126**[a]
Patents issued					
U.S.	364	465	496	526	545
Foreign	45	57	62	54	41
Total	**413**[a]	**533**[a]	**568**[a]	**583**[a]	**586**
Patents in force[b]					
U.S.	3,187	3,563	3,916	4,345	4,769
Foreign	209	264	306	417	450
Total	**3,396**	**3,827**	**4,222**	**4,762**	**5,219**
Licenses in force[b]					
U.S.	1,067	1,166	1,346	1,509	1,866
Foreign	73	87	92	110	272
Total	**1,242**[a]	**1,377**[a]	**1,624**[a]	**1,839**[a]	**2,138**
Licenses executed by type of license					
Exclusive	61	55	51	34	48
Partially exclusive	21	17	25	19	32
Nonexclusive	383	359	361	354	497
Other	7	1	1	2	6
Total	**483**[a]	**446**[a]	**442**[a]	**412**[a]	**583**
Licenses executed by type of property					
Patent	190	167	307	210	304
Research materials	0	0	0	0	0
Other[c]	232	173	204	221	245
Total	**422**	**340**	**511**	**431**	**549**
Licenses earning income during fiscal year	646	711	763	855	992
Licensing income	$7,265,033	$9,972,023	$10,971,837	$14,592,452	$21,387,512

[a]Agency did not provide a break out for all patent applications, patents issued, or licenses in the total figure.

[b]In force at the end of the fiscal year.

[c]Other includes copyrights.

Source: Department of Energy.

Table 6: Invention, Patenting, and Licensing Activity by the National Aeronautics and Space Administration for Fiscal Years 1997-2001

	Fiscal year				
Activity	**1997**	**1998**	**1999**	**2000**	**2001**
Invention disclosures	1,144	1,201	1,389	1,318	696
Patent applications					
U.S.	253	269	299	279	285
Foreign	12	13	21	21	17
Total	**265**	**282**	**320**	**300**	**302**
Patents issued					
U.S.	111	137	125	150	152
Foreign	0	1	4	17	7
Total	**111**	**138**	**129**	**167**	**159**
Patents in force[a]					
U.S.	1,267	1,237	1,227	1,236	1,302
Foreign	[b]	1[c]	28[c]	22[c]	66
Total	**1,267**	**1,238**	**1,255**	**1,258**	**1,368**
Licenses in force[a]					
U.S.	[d]	[d]	[d]	[d]	[e]
Foreign	[d]	[d]	[d]	[d]	[e]
Total	[d]	[d]	[d]	[d]	**269**
Licenses executed by type of license					
Exclusive	21	24	20	18	12
Partially exclusive	5	3	4	5	4
Nonexclusive	19	26	26	28	23
Other	1	6	5	14	7
Total	**46**	**59**	**55**	**65**	**46**
Licenses executed by type of property					
Patent	37	37	43	44	38
Research materials	0	0	0	0	0
Other	9	24	12	21	8
Total	**46**	**61**	**55**	**65**	**46**
Licenses earning income during fiscal year	84	100	105	111	114
Licensing income	$1,106,331	$1,226,263	$1,359,310	$1,775,010	$1,971,218

[a]In force at the end of the fiscal year.

[b]The number of foreign patents in force was not available for fiscal year 1997.

[c]Except for one facility, the number of foreign patents in force was not available for fiscal years 1998, 1999, and 2000.

[d]Current database does not track this data for this year.

[e]Data for U.S. and foreign were not broken out.

Source: National Aeronautics and Space Administration.

Table 7: Invention, Patenting, and Licensing Activity by the National Institutes of Health for Fiscal Years 1997-2001

	Fiscal year				
Activity	**1997**	**1998**	**1999**	**2000**	**2001**
Invention disclosures	333	344	341	381	379
Patent applications					
U.S.	160	151	198	196	174
Foreign	156	167	104	165	156
Total	**316**	**318**	**302**	**361**	**330**
Patents issued					
U.S.	158	177	171	130	99
Foreign	96	90	97	93	46
Total	**254**	**267**	**268**	**223**	**145**
Patents in force[a]					
U.S.	[b]	1,140	1,236	1,365	1,383
Foreign	[b]	[b]	[b]	[b]	641
Total	**[b]**	**[b]**	**[b]**	**[b]**	**2,024**
Licenses in force[a]					
U.S.	[b]	[b]	[b]	[b]	1,152[c]
Foreign	[b]	[b]	[b]	[b]	205[c]
Total	**[b]**	**[b]**	**[b]**	**[b]**	**1,357[c]**
Licenses executed by type of license					
Exclusive	28	26	35	31	44
Partially exclusive	1	1	2	0	3
Nonexclusive	182	184	170	157	153
Other	0	0	0	0	0
Total	**211**	**211**	**207**	**188**	**200**
Licenses executed by type of property					
Patent	164	147	157	147	149
Research materials	47	64	50	41	51
Other	0	0	0	0	0
Total	**211**	**211**	**207**	**188**	**200**
Licenses earning income during fiscal year	490	563	621	600	697
Licensing income	$35,700,000	$39,600,000	$44,600,000	$52,000,000	$46,100,000

[a]In force at the end of the fiscal year.

[b]Agency did not provide data.

[c]Estimate.

Source: National Institutes of Health.

Table 8: Invention, Patenting, and Licensing Activity by the National Oceanic and Atmospheric Administration for Fiscal Years 1997-2001

	Fiscal year				
Activity	**1997**	**1998**	**1999**	**2000**	**2001**
Invention disclosures	4	3	3	2	2
Patent applications					
U.S.	3	2	2	2	3
Foreign	0	0	0	0	0
Total	**3**	**2**	**2**	**2**	**3**
Patents issued					
U.S.	4	1	2	3	1
Foreign	0	0	0	0	0
Total	**4**	**1**	**2**	**3**	**1**
Patents in force[a]					
U.S.	14	12	11	9	10
Foreign	0	0	0	0	0
Total	**14**	**12**	**11**	**9**	**10**
Licenses in force[a]					
U.S.	[b]	[b]	[b]	[b]	1
Foreign	[b]	[b]	[b]	[b]	0
Total	[b]	[b]	[b]	[b]	**1**
Licenses executed by type of license					
Exclusive	[b]	[b]	[b]	[b]	1
Partially exclusive	[b]	[b]	[b]	[b]	0
Nonexclusive	[b]	[b]	[b]	[b]	0
Other	[b]	[b]	[b]	[b]	0
Total	[b]	[b]	[b]	[b]	**1**
Licenses executed by type of property					
Patent	[b]	[b]	[b]	[b]	1
Research materials	[b]	[b]	[b]	[b]	0
Other	[b]	[b]	[b]	[b]	0
Total	**[b]**	**[b]**	**[b]**	**[b]**	**1**
Licenses earning income during fiscal year	[b]	[b]	[b]	[b]	1
Licensing income	[b]	[b]	[b]	[b]	$1,500

[a]In force at the end of the fiscal year.

[b]Agency did not provide data.

Source: National Oceanic and Atmospheric Administration.

Table 9: Invention, Patenting, and Licensing Activity by the Department of the Navy for Fiscal Years 1997-2001

	Fiscal year				
Activity	**1997**	**1998**	**1999**	**2000**	**2001**
Invention disclosures	666	748	715	670	589
Patent applications					
U.S.	449	419	389	424	394
Foreign	22	24	56	52	57
Total	**471**	**443**	**445**	**476**	**451**
Patents issued					
U.S.	290	358	304	372	327
Foreign	0	3	9	8	9
Total	**290**	**361**	**313**	**380**	**336**
Patents in force[a]					
U.S.	2,184	2,245	2,158	2,241	2,295
Foreign	6	8	12	30	29
Total	**2,190**	**2,253**	**2,170**	**2,271**	**2,324**
Licenses in force[a]					
U.S.	62	71	80	87	99
Foreign	2	2	4	5	7
Total	**64**	**73**	**84**	**92**	**106**
Licenses executed by type of license					
Exclusive	5	5	4	5	6
Partially exclusive	1	2	5	2	6
Nonexclusive	4	9	4	8	13
Other	4	1	0	0	1
Total	**14**	**17**	**13**	**15**	**26**
Licenses executed by type of property					
Patent	14	15	13	15	26
Research materials	0	0	0	0	0
Other	0	0	0	0	0
Total	**14**	**15**	**13**	**15**	**26**
Licenses earning income during fiscal year	57	69	61	65	87
Licensing income	$477,970	$917,836	$676,555	$698,897	$1,245,629

[a]In force at the end of the fiscal year.

Source: U.S. Navy.

Table 10: Invention, Patenting, and Licensing Activity by the U.S. Geological Survey for Fiscal Years 1997-2001

	Fiscal year				
Activity	**1997**	**1998**	**1999**	**2000**	**2001**
Invention disclosures	4	4	5	9	4
Patent applications					
U.S.	2	0	4	4	16
Foreign	0	0	0	0	0
Total	**2**	**0**	**4**	**4**	**16**
Patents issued					
U.S.	1	2	1	2	4
Foreign	0	0	0	0	0
Total	**1**	**2**	**1**	**2**	**4**
Patents in force[a]					
U.S.	35	37	38	38	42
Foreign	10	10	10	0	0
Total	**45**	**47**	**48**	**38**	**42**
Licenses in force[a]					
U.S.	10	11	4	4	6
Foreign	0	0	8	0	0
Total	**10**	**11**	**12**	**4**	**6**
Licenses executed by type of license					
Exclusive	2	0	2	2	0
Partially exclusive	0	0	0	0	0
Nonexclusive	8	11	8	2	2
Other	0	0	0	0	0
Total	**10**	**11**	**10**	**4**	**2**
Licenses executed by type of property					
Patent	8	11	12	4	2
Research materials	0	0	0	0	0
Other	0	0	0	0	0
Total	**8**	**11**	**12**	**4**	**2**
Licenses earning income during fiscal year	0	11	12	8	5
Licensing income	0	$2,500,000	$2,000,000	$850,000	$220,000

[a]In force at the end of the fiscal year.

Source: U.S. Geological Survey.

Appendix V: Summary of Guidelines for Agency Reporting under the Technology Transfer Commercialization Act of 2000

Among other things, the Technology Transfer Commercialization Act of 2000 (TTCA) requires agencies with laboratories or technology transfer functions to report annually on their operations to the Office of Management and Budget and the Department of Commerce. With the assistance of the Interagency Working Group on Technology Transfer, the Department of Commerce issued guidelines on December 11, 2001, for agencies to use in developing and submitting these annual reports. Table 11 summarizes certain statistical data requested by Commerce, with additional information in some cases detailing the specific data elements to be used in the development of the statistics.

Table 11: Summary of Department of Commerce Guidelines for Statistical Information to be Included in Agency TTCA Reports

Category	Statistics to be reported	Additional information provided by Commerce to clarify data elements to be included in statistics
Collaborative relationships for research, development, and demonstration		
Cooperative research and development agreements (CRADA)	CRADAs active at the end of the fiscal year.	"Active" means legally in force; comprehensive of all agreements done under the authority of 15 USC 3710a.
	New CRADAs executed in fiscal year.	No additional information provided.
	Active "nontraditional" CRADAs at the end of the fiscal year.	A "nontraditional" CRADA is an agreement done under the authority of sec. 3710a but used for special purpose. Examples would be material transfer CRADAs, technical assistance that may result in protected information, etc.
	New "nontraditional" CRADAs executed in the fiscal year.	No additional information provided.
Other types of collaborative research, development, and demonstration relationships	Nature and number of collaborative relationships.	As is relevant for a laboratory.
Intellectual property management		
Invention disclosure and patenting	Invention disclosures in the fiscal year.	No additional information provided.
	Patent applications filed in the fiscal year.	For inventions arising at a federal laboratory. Includes non-provisional U.S. and foreign applications in which the agency has a patent ownership position. Excludes: (1) divisional and continuation applications and (2) duplicate foreign and Patent Cooperation Treaty applications.
	Patents issued in the fiscal year for laboratory inventions.	TTCA uses term "patents received" instead of "patents issued."
Licensing	Invention licenses active in the fiscal year.	"Active" means legally in force whether or not royalty bearing. Multiple inventions in a single license are counted as one license.
	New invention licenses in the fiscal year	No additional information provided.
	Active licenses for "other" intellectual	Relevant if such properties are licensed by

Category	Statistics to be reported	Additional information provided by Commerce to clarify data elements to be included in statistics
	property in the fiscal year.	the laboratory or agency. "Other" intellectual property includes software, tangible research products such as biological materials, and protected data.
	Active licenses for which the laboratory or agency received royalty income in the fiscal year, subdivided by exclusive, partially exclusive, and nonexclusive licenses.	"Royalties" include up-front fees, minimum annual payments, earned royalties on sales. In-kind contributions and cost reimbursements are not recognized as royalties.
	Licenses terminated for cause in the fiscal year.	Same information requested by TTCA; see 15 USC 3710(f)(2)(B)(vi).
	Elapsed time from date of (formal) license application to date of license execution.	Same information requested by TTCA; see 15 USC 3710(f)(2)(B)(iii). Covers licenses granted in the fiscal year being reported. Concerns initial license for a technology rather than multiple licenses where the technology was expected to be licensed to multiple parties. Date of license application is the date the laboratory formally acknowledges a written request and agrees to enter into negotiations. Because the number of licenses typically will be greater than one, information about the distribution of elapsed times will be needed. If so, providing the number of licenses with minimum, median, and maximum elapsed time should suffice. If the distribution has little central tendency and/or is grossly skewed, greater detail on the distribution may be needed.
Income	Total income: • Income for all licenses active in the fiscal year.	Total income includes license issue fees, minimum annual royalties, paid-up license fees, earned royalties, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.
	• Income from "other" intellectual property licenses.	Relevant if such properties are licensed by the laboratory or agency. "Other" intellectual property includes software, tangible research products such as biological materials, and protected data.
	Disposition of royalty income or other payments from licensing.	Such as to inventors, back to laboratories, etc. It is recognized that there is not a balance between income and expenditures in any given fiscal year. It is also recognized that agencies may not have full reporting from labs on the use of funds. The agency should respond as best it can, based on the information available.
	Total earned royalty income: • Range of values across all royalty	"Earned royalty" means a royalty based upon use of a licensed invention (usually,

Category	Statistics to be reported	Additional information provided by Commerce to clarify data elements to be included in statistics
	bearing licenses in the fiscal year. • Median value. • Subtotal from top 1 percent of licenses. • Subtotal from top 5 percent of licenses. • Subtotal from top 20 percent of licenses.	a percentage of sales or units sold) rather than a license issue fee or a minimum royalty. These distribution statistics can be excluded if such information would reveal the amount of royalty income associated with an individual license or licensee. Start with a list of all royalty-producing licenses at the lab, ranked by the level of earned royalties received in the fiscal year. Then, report the sum of revenue in the fiscal year from the top 1 percent on the list, from the top 5 percent, and so on.
Other measures of performance deemed important		
Other activity	Other relevant performance measures.	Identify, discuss relevant activity/performance data, such as performance goals established in the agency's Strategic and Annual Performance Plans under Government Performance and Results Act.
Information about technology transfer outcomes		
Outcomes	Did technology arising under a CRADA or other collaborative relationship become commercially available?	(a) Yes/no or number, if known. (b) Agency selected case histories. Generally, these cases will have been years in maturation. Objective success stories will likely be those based upon reports required in licenses related to earned income. Subjective success stories may also be useful, based on anecdotal knowledge of the transfer of know-how/know-what that resulted in commercial applications.
	Did technology arising under a CRADA or other collaborative relationship strengthen the capabilities of the laboratory?	Same information elements as above. Often a laboratory's technical staff will advance their own competencies or make a breakthrough that will significantly impact the ability of the laboratory to carry out its mission activities.
	Did technology licensed by the laboratory become commercially available?	Same information elements as above. Same comment as for first question above.
	Did a product or process developed by a laboratory's licensee strengthen the laboratory's capabilities?	Same information elements as above. Same comment as for second question above.

Category	Statistics to be reported	Additional information provided by Commerce to clarify data elements to be included in statistics
	Other kinds of outcomes (specify and describe).	For example, expanded know-how, know-what of laboratory scientists and engineers. Such knowledge may be shared with others through technical presentations or referred papers to advance the larger body of knowledge.

Source: U.S. Department of Commerce, Annual Reporting on Agency Tech Transfer in response to the TTCA 2000—Data Elements of the Agency Annual Reports (Dec. 11, 2001).

Appendix VI: Statistics Provided by Nine Selected Agencies to the Department of Commerce under the TTCA of 2000

Table 12: Collaborative Relationship for Research, Development, and Demonstration, Fiscal Year 2001

	Cooperative research and development agreements					
	Total		Non-traditional		Other collaborative relationships	
Agency	Active[a]	New[b]	Active[a]	New[b]	Active[a]	New[b]
Agricultural Research Service	**219**	**49**	0	0	Not provided	106
Air Force	**320**	**49**	14	5	213	81[c]
Army	**998**	**235**	0	0	0	0
Department of Energy	**558**	**204**	0[d]	0[d]	Not provided	Not provided
National Aeronautics and Space Administration	**1**	**0**	0	0	0	0
National Institutes of Health	**420**	**120**	209	76	0	0
National Oceanic and Atmospheric Administration	**8**	**3**	0	0	0	0
Navy	**317**	**167**	72	46	0	0
U.S. Geological Survey	**42**	**14**	7	7	Not provided	Not provided

[a]Active as of the end of the fiscal year.

[b]Executed during the fiscal year.

[c]For the Air Force 73 of 81 are Educational Partnership Agreements.

[d]DOE officials said that DOE does not enter into non-traditional cooperative research and development agreements.

Source: Agencies cited and U.S. Department of Commerce.

Table 13: Invention Disclosure and Patenting, Fiscal Year 2001

Agency	Invention disclosures	Patent applications	Patents issued
Agricultural Research Service	118	83	64
Air Force	85	101	114
Army	292	262	156
Department of Energy	1,527	792	605
National Aeronautics and Space Administration	696	151	159
National Institutes of Health	379	179	99
National Oceanic and Atmospheric Administration	1	3	1
Navy	573	421	320
U.S. Geological Survey	4	16	4
Total	**3,675**	**2,008**	**1,522**

Source: Agencies cited and U.S. Department of Commerce.

Table 14: New, Active, and Terminated Licenses during Fiscal Year 2001

	Number of licenses			
Agency	Active licenses on inventions	Newly executed licenses on inventions	Licenses on other intellectual property[a]	All licenses terminated for cause
Agricultural Research Service	255	31	0	1
Air Force	62	15	0	0
Army	101	8	0	0
Department of Energy	1,162	226	843	60
National Aeronautics and Space Administration	292	42	36	23
National Institutes of Health	977	200	355	9
National Oceanic and Atmospheric Administration	1	1	0	0
Navy	102	25	0	2
U.S. Geological Survey	6	2	0	0
Total	**2,958**	**550**	**1,234**	**95**

[a]Other intellectual property includes software, tangible research products (such as biological materials), and protected data.

Source: Agencies cited and U.S. Department of Commerce.

Table 15: Active Licenses That Had Royalty Income, by Type, Fiscal Year 2001

	Type of license			
Agency	Exclusive	Non-exclusive	Partially exclusive	Total
Agricultural Research Service	78	23	19	**120**
Air Force	8	3	0	**11**
Army	13	11	4	**28**
Department of Energy	174	726	112	**1,012**
National Aeronautics and Space Administration	57	44	13	**114**
National Institutes of Health	100	583	13	**696**
National Oceanic and Atmospheric Administration	1	0	0	**1**
Navy	15	34	17	**66**
U.S. Geological Survey	0	6	0	**6**
Total	**446**	**1,430**	**178**	**2,054**

Source: Agencies cited and U.S. Department of Commerce.

Table 16: Income from Licenses by Source, Fiscal Year 2001

	Income[a]		
Agency	Invention licenses active during fiscal year	Other intellectual property[b]	Total
Agricultural Research Service[c]	$2,622,000	0	**$2,622,000**
Air Force	99,038	0	**99,038**
Army	855,500	0	**855,500**
Department of Energy	18,921,843	$1,870,071	**21,403,362[d]**
National Aeronautics and Space Administration	1,318,864	651,855	**1,971,218[d]**
National Institutes of Health	40,700,000	5,400,000	**46,100,000**
National Oceanic and Atmospheric Administration	1,600	0	**1,600**
Navy	1,240,630	0	**1,240,630**
U.S. Geological Survey[e]	220,000	0	**220,000**
Total	**$65,979,475**	**$7,921,926**	**$74,513,348**

[a]Income includes all licensing income including license issue fees, minimum annual royalties, paid-up license fees, earned royalties, etc.

[b]Other intellectual property includes software, tangible research products (such as biological materials), and protected data.

[c]Does not include U.S. Forest Service.

[d]Totals provided by the agencies are greater than the sum of the columns.

[e]Agency received $200,000 in fiscal year 2001 as final partial-year payments on expired patents.

Source: Agencies cited and U.S. Department of Commerce.

Table 17: Characteristics of Earned Royalty Income Received, Fiscal Year 2001

	Earned royalty income						
		Range			Distribution		
Agency	Total	Minimum	Maximum	Median	Top 1 percent	Top 5 percent	Top 20 percent
Agricultural Research Service	**$1,409,252**	$78	$563,320	$5,723	Not provided[a]	$723,167	$1,109,051
Air Force	**Not provided**	1,500	17,500	12,038	$17,500	17,500	17,500
Army	**Not provided**	100	225,000	7,800	229,000	346,000	580,000
Department of Energy	**7,832,481**	2	1,584,922	3,889	2,699,134	5,271,631	7,162,951
National Aeronautics and Space Administration	**521,164**	71	232,159	21,735	Not provided	Not provided	419,867
National Institutes of Health	**35,990,362**	8	11,000,000	2,200	Not provided[a]	32,728,556	35,516,006
National Oceanic and Atmospheric Administration	**1,600**[b]	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Navy	**Not provided**	75	76,085	1,283	76,085	76,085	83,274
U.S. Geological Survey	**220,000**	2,000	20,000	Not provided	Not provided	Not provided	Not provided

[a]Not provided because the agency believed the information might reveal income associated with an individual licensee.

[b]Earned royalty income is from one license; thus, there is no range.

Source: Agencies cited and U.S. Department of Commerce.

Table 18: Disposition of License Income, Fiscal Year 2001

Agency	Inventor awards	Salaries	Patent fees	Other	Total
Agricultural Research Service	$681,700	$1,075,000	$707,900	$157,300	**$2,621,900**
Air Force	[a]	[a]	[a]	[a]	[a]
Army	[a]	[a]	[a]	[a]	[a]
Department of Energy	5,942,497	Not provided	Not provided	10,413,555	**16,356,052**
National Aeronautics and Space Administration	615,558	Not provided	Not provided	835,431[b]	**1,450,989**
National Institutes of Health[c]	Not provided	Not provided	Not provided	Not provided	**Not provided**
National Oceanic and Atmospheric Administration	1,600	0	0	0	**1,600**
Navy	[a]	[a]	[a]	[a]	[a]
U.S. Geological Survey	11,000	Not provided	Not provided	209,000	**220,000**
Total	**$7,252,355**	**$1,075,000**	**$707,900**	**$11,615,286**	**$20,650,541**

Note: The Department of Commerce guidelines asked the agencies to provide statistics on the disposition of royalty income but did not specify the categories into which the statistics were to be subdivided. Four agencies—the Air Force, the Army, the National Institutes of Health, and the Navy—did not provide any data. The other five agencies varied in the disposition categories listed.

[a]According to a Department of Commerce official, the Department of Defense did not provide separate statistics for the individual military services. However, the Department of Defense generally, provides 20 percent of license income to the inventors and the remaining 80 percent is used for other awards and additional research and development.

[b]Figure includes $223,119 to National Aeronautics and Space Administration Centers, $246,035 to the U.S. Treasury and $366,277 to the California Institute of Technology.

[c]Income was distributed according to the law to inventors and was used to support technology transfer operations and conduct further research.

Source: Agencies cited and U.S. Department of Commerce.

Table 19: Time Elapsed between Application and License Agreement

	Average elapsed days			
Agency	All licenses	Exclusive license	Non-exclusive license	Partially exclusive license
Agricultural Research Service	106	88[a]	65[a]	166[a]
Air Force[b]	Not provided	Not provided	Not provided	Not provided
Army[b]	Not provided	Not provided	Not provided	Not provided
Department of Energy[b]	Not provided	Not provided	Not provided	Not provided
National Aeronautics and Space Administration	439	Not provided	Not provided	Not provided
National Institutes of Health	Not provided	267	148	582
National Oceanic and Atmospheric Administration	240[c]	240[c]	Not applicable	Not applicable
Navy[b]	Not provided	Not provided	Not provided	Not provided
U.S. Geological Survey	105	Not applicable	105[d]	Not applicable

[a]Figure is for two licenses.

[b]Data were not collected or readily available; however, the agency plans to address this reporting requirement in the future.

[c]Figure is for one license. The elapsed time was given as 8 months from date of formal license application to date of license execution.

[d]Figure is for two licenses. The elapsed time for one license was 3 months and elapsed time for the other license was 4 months.

Source: Agencies cited and U.S. Department of Commerce.

Appendix VII: Differences in Statistics Provided under the TTCA of 2000 and Statistics Provided to GAO by Nine Agencies

Appendix IV of this report provides statistics on technology transfer activities provided directly to us by nine agencies whose activities we reviewed, while appendix VI summarizes the statistical information provided to the U.S. Department of Commerce by these same nine agencies under the Technology Transfer Commercialization Act of 2000. In some cases, the statistics disagreed, even though the data requested were seemingly the same. The tables below show the differences and the agencies' explanations for why they occurred.

Table 20: Differences in Statistics Provided to U.S. Department of Commerce and Statistics Provided to GAO for Invention Disclosures, Fiscal Year 2001

Agency	Statistics provided to Commerce	Statistics provided to GAO	Difference	Explanation
Air Force	85	139	-54	DOD had a February cut-off date for data to OMB/Commerce. The GAO data are updated data.
Army	292	270	22	One command overstated disclosures to Commerce.
DOE	1,527	1,479	48	Not determined.
NOAA	1	2	-1	Data provided to GAO are correct. The data provided to OMB/Commerce are in error.
Navy	573	589	-16	DOD had a February cut-off date for data to OMB/Commerce. The GAO data is updated data.

Source: Agency reports to the U.S. Department of Commerce on agency technology transfer for fiscal year 2001 and statistics provided to GAO by the agencies cited.

Table 21: Differences in Statistics Provided to U.S. Department of Commerce and Statistics Provided to GAO for Patents Issued Fiscal Year 2001

Agency	Statistics provided to Commerce	Statistics provided to GAO	Difference	Explanation
ARS	64	76	-12	May not have included foreign patents in OMB/Commerce data.
Army	156	164	-8	DOD had a February cut-off date for data to OMB/Commerce. The GAO data are updated data.
DOE	605	586	19	Not determined.
NIH	99	145	-46	May not have included foreign patents in OMB/Commerce data.
Navy	320	336	-16	DOD had a February cut-off date for data to OMB/Commerce. The GAO data is updated data.

Source: Agency reports to the U.S. Department of Commerce on agency technology transfer for fiscal year 2001 and statistics provided to GAO by the agencies cited.

Table 22: Differences in Statistics Provided to U.S. Department of Commerce and Statistics Provided to GAO for Newly Executed Licenses, Fiscal Year 2001

Agency	Statistics provided to Commerce	Statistics provided to GAO	Difference	Explanation
Air Force	15	17	-2	DOD had a February cut-off date for data to OMB/Commerce. The GAO data are updated data.
Army	8	14	-6	DOD had a February cut-off date for data to OMB/Commerce. The GAO data are updated data.
DOE	226	583	-357	The figure provided to OMB/Commerce did not include licenses for copyrights and other non-patent types of intellectual property.
NASA	42	46	-4	OMB/Commerce data included only patents.
Navy	25	26	-1	DOD had a February cut-off date for data to OMB/Commerce. The GAO data are updated data.

Source: Agency reports to the U.S. Department of Commerce on agency technology transfer for fiscal year 2001 and statistics provided to GAO by the agencies cited.

Table 23: Differences in Statistics Provided to U.S. Department of Commerce and Statistics Provided to GAO for Licenses That Had Income, Fiscal Year 2001

Agency	Statistics provided to Commerce	Statistics provided to GAO	Difference	Explanation
Air Force	11	12	-1	DOD had a February cut-off date for data to OMB/Commerce. The GAO data are updated data.
DOE	1,012	992	20	Not determined.
NIH	696	697	-1	Not determined.
Navy	66	87	-21	DOD had a February cut-off date for data to OMB/Commerce. The GAO data are updated data.
USGS	6	5	1	The OMB/Commerce figure included one license with income other than royalties.

Source: Agency reports to the U.S. Department of Commerce on agency technology transfer for fiscal year 2001 and statistics provided to GAO by the agencies cited.

Table 24: Differences in Statistics Provided to U.S. Department of Commerce and Statistics Provided to GAO for Income from Licenses, Fiscal Year 2001

Agency	Statistics provided to Commerce	Statistics provided to GAO	Difference	Explanation
Army	$855,500	$845,472	$10,028	One laboratory reported to GAO the amount received by the laboratory, but did not include the amount received by the inventors.
DOE	21,403,362	21,387,512	15,850	May be due to confusion as to "earned income" and "total income."
NOAA	1,600	1,500	100	Data provided to GAO are correct. The data provided to OMB/Commerce are in error.
Navy	1,240,630	1,245,629	-4,999	DOD had a February cut-off date for data to OMB/Commerce. The GAO data are updated data.

Source: Agency reports to the U.S. Department of Commerce on agency technology transfer for fiscal year 2001 and statistics provided to GAO by the agencies cited.

Appendix VIII: Options to Improve Compliance with Reporting Requirements under the Bayh-Dole Act

In August 1999, we issued a report entitled *Technology Transfer: Reporting Requirements for Federally Sponsored Inventions Need Revision.*[1] Among other things, we noted in that report that the Congress might wish to consider standardizing, improving, and streamlining the reporting process for inventions subject to the Bayh-Dole Act and Executive Order 12591. In appendix IV of that report, we outlined some specific options available if the Congress did consider such changes. Because we refer to these options in our current report, we repeat them below.

Options for Standardizing, Streamlining, and Improving Reporting Requirements Under the Bayh-Dole Act and Executive Order 12591

In this report, we state that the Congress may wish to consider amending the Bayh-Dole Act to standardize, improve, and streamline the reporting process for inventions subject to both the act and Executive Order 12591. Specifically, such changes could include (1) requiring the Secretary of Commerce to develop standardized disclosure forms and utilization reports for federally sponsored inventions, (2) making the patent the primary control mechanism for reporting and documenting the government's rights and the only written instrument for confirming the government's royalty-free license, and (3) requiring the Patent and Trademark Office (PTO) to provide information to the funding agencies to assist them in monitoring compliance.

During our meetings with representatives from federal funding agencies, contractors, and grantees, we discussed options for changes to the reporting requirements. The officials generally agreed that the types of changes suggested below could improve the quality of data available and reduce the reporting burden. Officials from PTO told us that they did not disagree with these suggestions. However, they pointed out that an international treaty is being negotiated that would standardize patent applications and could affect the types of information that could be required on a patent application.

The options we discussed are as follows:

- Eliminating the requirement that the contractor or grantee submit a confirmatory license as a separate written instrument on each invention. These instruments are not always submitted or used, and the license itself can be more easily documented on and accessed from the patent itself. In

[1] GAO/RCED-99-242.

effect, this change would appear to eliminate the need for the Government Register.

- Requiring the Department of Commerce to develop, and by regulation require the use of, a standardized invention disclosure form for all federal agencies, contractors, and grantees. Under the current procedures, each contractor or grantee generally has its own form. A standardized form would make the procedure uniform and consistent among all the agencies, contractors, and grantees.

- Making the patent the only instrument for documenting the confirmatory license. This would entail eliminating the current requirement that the contractor or grantee file a separate election to retain title. Instead, within 2 years of disclosure (or within 1 year if publication, sale, or public use of the invention has initiated the 1-year statutory period in which valid patent protection can be obtained in the United States), require the contractor or grantee to file a patent application with PTO. This would reduce a step in the process for both the applicant and the agency and, in most cases, shorten the time between the date the contractor or grantee realizes it has an invention and the date it applies for a patent.

- Requiring that the government interest statement on the patent application include the name of each specific agency that funded the research, the contract or grant number(s) under which the invention was created, and a provision stipulating that the government has a nonexclusive, paid-up, royalty-free right to the use of the invention.

- Requiring that the contractor or grantee provide a copy of each patent application—including divisionals, continuations, and continuations-in-part—to the funding agency.[2] This would inform the funding agency that the contractor or grantee has filed the application within the required time and that the agency has a record of all patent applications related to the original invention disclosure. Since patent applications are standard for all

[2]The original application for a particular patent is referred to as the parent. Subsequent applications may relate back to the parent either as a divisional, a continuation, or a continuation-in-part. A divisional is a later application that is carved out of a pending application and discloses or claims only subject matter disclosed in the earlier application. A continuation is a second application for the same invention claimed in a prior application that discloses and claims only subject matter disclosed in prior applications and introduces into the case a new set of claims. A continuation-in-part repeats some substantial portion or all of the earlier application but adds matter not disclosed in the earlier case.

applicants, this also means that all funding agencies receive standardized forms.

- Requiring PTO to (1) inform each funding agency named in a government interest statement that PTO has received a patent application on the invention and (2) provide the serial number of the application to the agency. This provides a cross-check for the funding agency to ensure it has received the patent application. Also, the agency has the serial number if it needs to interact with PTO.

- Requiring PTO to inform the funding agency of major events—such as the abandonment of an application—that would affect the government's rights during the applicant's prosecution of the patent. This would allow the funding agency to take timely action at any point its rights to the invention are threatened.

- Requiring PTO to show in its Patent Gazette—the official journal on patents and trademarks—that the issued patent is subject to a government interest. This would provide notice to the funding agency and the public that the patent has been issued and that the government has rights to the invention. Anyone wanting more information could then access the patent from PTO's Internet Web site or official patent files.

- Permitting PTO to charge the applicant a fee for an application that contains a government interest section. The fee should be commensurate with PTO's additional costs for its services under the revised requirements. This is in keeping with PTO's position of being self-sufficient through fees. The fee would be paid by the applicant and would be one additional factor the contractor or grantee would need to consider in deciding whether to file a patent application. However, the additional cost of the government interest fee should be offset to some extent by the reduced costs of the lesser reporting burden on the contractor or grantee.

- Requiring the Department of Commerce to develop a uniform utilization report whereby contractors and grantees holding title to federally sponsored inventions must report annually on the utilization of each invention. These utilization reports could be used to provide information on the status of development, the date of first commercial sale or use, and the gross royalties received by the contractor or grantee. The regulations already allow—but do not mandate—agencies to require their contractors and grantees to provide these types of data. Among other things, a utilization report on every invention would help the funding agency to determine whether the contractor or grantee is actively pursuing

development and commercialization of the invention—one of the agency's oversight responsibilities for inventions subject to the Bayh-Dole Act and Executive Order 12591.

Some of these changes could be made by the Department of Commerce through revisions to the existing regulations. However, the Congress may need to consider changes to the law because (1) the changes need to be made in conjunction with each other and (2) such actions as eliminating the need for the Government Register, establishing additional requirements for inventions created under Executive Order 12591, and placing additional requirements on PTO require congressional action.[3] Also, the Congress may wish to consider the impact of any treaty—such as the one now being negotiated—that would affect the types of information that could be required on the patent application.

[3] The Government Register is maintained by the USPTO for the purpose of recording the "confirmatory licenses" agencies receive from contractors and grantees confirming that the government has rights in the inventions in question. It is a separate record from the "government interest" section on the patent itself, which also shows that the invention was created with government support and that the government may have rights in the invention.

Appendix IX: Comments from the Department of Commerce

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

OCT 16 2002

Mr. John Stephenson
Director
Natural Resources and Environment
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Stephenson:

Thank you for the opportunity to comment on the General Accounting Office (GAO) draft report entitled, "Intellectual Property: Federal Agency Efforts in Transferring and Reporting New Technology (GAO-03-47)."

Enclosed are the Department's comments on the draft report. We hope these comments strengthen your final report and assist you in addressing this important issue.

Thank you again for requesting the Department's views on the draft report.

Sincerely,

Donald L. Evans

Enclosure

Note: Page numbers in the draft report may differ from those in this report.

Comment and Recommendation changes on GAO's Draft Report GAO-03-47

Intellectual Property: Federal Agency Efforts in Transferring and Reporting New Technology

Thank you for the opportunity to review and comment on the draft of GAO's report; "*Intellectual Property: Federal Agency Efforts in Transferring and Reporting New Technology* (GAO-03-47)."

Overall, we would like to commend GAO for a useful report. Over the past year, the performance reporting process was in its first cycle under the revised requirements of the Technology Transfer Commercialization Act of 2000(TTCA), some aspects of which differed significantly from the prior procedures under the Stevenson-Wydler Act. From DOC's perspective, the GAO report generally provides a realistic analysis of the first cycle of the new reporting process. We believe that the report's recommendations are reasonable and their adoption would help improve performance in the next reporting cycle, this fall. We note that DOC is beginning to implement many of them.

Our comments are directed at the portion of the GAO report that addresses the implementation in 2002 of the revised federal lab technology transfer reporting requirements under the TTCA. As your report indicates, the Department of Commerce (DOC) had several significant roles in this process.

We have several comments to make about the specifics of the text:

1. As your report notes (pages 2, 5, and elsewhere), a *Summary Report*, prepared by the Secretary of Commerce, is the second stage of the revised annual reporting process for the federal labs under the TTCA. The DOC has now completed its work on the 2002 edition of that report, which we expect to publish and transmit to the President and the Congress shortly: *Summary Report on Federal Laboratory Technology Transfer: 2002 Report to the President and the Congress under the Technology Transfer and Commercialization Act*.

2. The federal agency statistics cited in DOC's *2002 Summary Report* are more complete in some places than those listed in the GAO report's Appendix VI tables. In preparing the 2002 report, DOC's Office of Technology Policy (OTP) worked closely with the federal agencies to review and clarify the information submitted in their individual agency reports. As a result, some of the items the GAO tables describe as "not provided" are, in fact, included in the DOC's *Summary Report*. We have indicated to the GAO report authors that we would be pleased to provide them with the most current agency data that we have.

3. A related observation is that the federal-wide statistical totals reported by OTP in recent Biennial Reports, as well as the forthcoming annual *Summary Report* include a more comprehensive set of federal agencies than the set of agencies included in GAO's present report. GAO's use of a selected subset of agencies with federal labs, as well as describing totals across

this subset, is certainly reasonable, given the study design. This may, however, cause some confusion if readers compare the GAO statistics with those of DOC's continuing series of reports on federal lab technology transfer. We urge GAO to note this discrepancy and explain the reason for it in this report.

4. GAO's recommendation (pages 5, 41-42) that, as needed, the Department of Commerce revisit, review, and refine the December 2001 guidelines for data elements included in the agencies' reports is noted. The detail of the data requested, the importance of clear definitions, and the evolving state of the federal labs' databases concerning their technology transfer activities emphasize the importance of continuing review of data collection procedures. This topic is already on the agenda for near-term discussion with the Interagency Working Group members, before the next cycle of the agency reporting commences later this fall.

We would also note that substantial effort was devoted in 2001 by DOC's OTP, in extended discussion with the Interagency Working Group on Technology Transfer, to prepare detailed guidelines about the activity data and other program information essential for agencies' 2002 reporting.

5. We believe that GAO's recommendation (pages 5, 42) that the Office of Management and Budget (OMB) play a role in developing procedures "for accumulating, collating, and reporting the information submitted by the agencies under the TTCA has merit. It appears that uncertainty about the submission process was a contributing factor to agencies' late submissions of their technology transfer reports in 2002. While we believe that flexibility should be afforded to agencies in the substance of reporting under the TTCA, guidance from OMB that clarifies how agencies' technology transfer reports should be submitted to OMB as part of the budget process would be of great help to agencies.

We would be happy to discuss these observations with the GAO project staff in greater detail, should that be useful.

Appendix X: GAO Contacts and Staff Acknowledgments

GAO Contacts

John P. Hunt, Jr. (404) 679-1822
Frankie Fulton (404) 679-1805

Acknowledgments

In addition to those named above, Gene Barnes, Bert Japikse, Deborah Ortega, Paul Rhodes, and Lynne Schoenauer made key contributions to this report.

GAO's Mission

The General Accounting Office, the investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

Obtaining Copies of GAO Reports and Testimony

The fastest and easiest way to obtain copies of GAO documents at no cost is through the Internet. GAO's Web site (www.gao.gov) contains abstracts and full-text files of current reports and testimony and an expanding archive of older products. The Web site features a search engine to help you locate documents using key words and phrases. You can print these documents in their entirety, including charts and other graphics.

Each day, GAO issues a list of newly released reports, testimony, and correspondence. GAO posts this list, known as "Today's Reports," on its Web site daily. The list contains links to the full-text document files. To have GAO e-mail this list to you every afternoon, go to www.gao.gov and select "Subscribe to daily E-mail alert for newly released products" under the GAO Reports heading.

Order by Mail or Phone

The first copy of each printed report is free. Additional copies are $2 each. A check or money order should be made out to the Superintendent of Documents. GAO also accepts VISA and Mastercard. Orders for 100 or more copies mailed to a single address are discounted 25 percent. Orders should be sent to:

U.S. General Accounting Office
441 G Street NW, Room LM
Washington, D.C. 20548

To order by Phone:	Voice:	(202) 512-6000
	TDD:	(202) 512-2537
	Fax:	(202) 512-6061

To Report Fraud, Waste, and Abuse in Federal Programs

Contact:

Web site: www.gao.gov/fraudnet/fraudnet.htm
E-mail: fraudnet@gao.gov
Automated answering system: (800) 424-5454 or (202) 512-7470

Public Affairs

Jeff Nelligan, managing director, NelliganJ@gao.gov (202) 512-4800
U.S. General Accounting Office, 441 G Street NW, Room 7149
Washington, D.C. 20548