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Briefing Report to the Chairman, Committee on Science, Space and Technology, House of Representatives

March 1988

TECHNOLOGY TRANSFER

Constraints Perceived by Federal Laboratory and Agency Officials

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The Honorable Robert A. Roe
Chairman, Committee on Science,
Space and Technology
House of Representatives

Dear Mr. Chairman:

To assist the Committee's Task Force on Technology Policy, you asked us to interview federal laboratory and agency officials to identify constraints to transferring technology from federal laboratories to U.S. businesses. While the officials identified some constraints that affect only their laboratories, this report provides information on the following four major constraints that officials at several federal laboratories identified.

-- While recent changes in the law allow federal laboratories to patent and exclusively license inventions, federal computer software is publicly disseminated; thus businesses do not have an incentive to fully develop and market it.

-- Because federal laboratories generally cannot conduct proprietary research and therefore competitors can obtain access to research results, businesses are less inclined to enter into collaborative research efforts.

-- The requirement that several of the Department of Energy's contractor-operated laboratories must request the Department to waive its title rights to inventions that they make causes uncertainty and delay and reduces industry interest in getting involved.

-- Federal laboratories, in their efforts to be fair in providing businesses opportunities to collaborate on research, may institute burdensome and time-consuming procedures that inhibit industry participation.

The information in this report reflects the perceptions of research managers and technology transfer officials at 10 federal laboratories and program officials and/or patent counsels in 6 federal agencies. (See table 1.1 for a list of the laboratories and agencies.) We selected the 10 federal laboratories because (1) they are among the largest in each of the 6 agencies, with a total research and development budget of $5 billion in fiscal year 1986 and (2) their research is likely to have important commercial applications. The laboratories include six government-operated laboratories with federal employees and four contractor-operated laboratories that are run by universities or large businesses under contract with the government. We did not interview executives from businesses or trade associations to discuss their perceptions about constraints to technology transfer.

In summary, the federal laboratory and agency officials we interviewed support the thrust of legislation and executive actions during the past 10 years to improve the link between the federal laboratories' technology base and U.S. businesses. These laws authorize federal laboratories to patent and exclusively license inventions and collaborate with businesses on research and development. Many of the officials stated, however, that the four identified constraints need to be addressed to further improve the effectiveness of their laboratories' technology transfer efforts. They believe that removing or reducing these constraints would (1) provide more incentives to transfer computer software technology to U.S. businesses, (2) encourage U.S. businesses to make better use of federal laboratory resources, and (3) reduce administrative burdens and time delays for interactions. The following paragraphs elaborate on each of the four perceived constraints.

Officials at 7 of the 10 federal laboratories and 5 of the 6 federal agencies stated that technology transfer is constrained by legislation that requires federal agencies to publicly disseminate computer software. They noted that although the Patent and Trademark Amendments of 1980, as amended, authorize federal agencies to patent and exclusively license inventions and permit most contractor-operated federal laboratories to elect to retain title to inventions that they make, the act does not address computer software, which is considered technical data and normally cannot be patented. The officials propose that federal law be amended so that the transfer of computer software would be treated similarly to federal inventions because (1) no apparent reason exists for treating federal

laboratory inventions and computer software differently, (2) as with inventions, the most effective way to transfer computer software in many cases is to copyright and exclusively license it to a software company, (3) federal employees who develop computer software do not have the same incentives to commercialize it as those who make inventions because they cannot share in royalty income, and (4) most federal programs to publicly disseminate computer software provide foreign business competitors equal access to the software.

Officials at 7 of the 10 federal laboratories and 4 of the 6 federal agencies stated that their limited authority to conduct proprietary research is a constraint to collaborating with businesses. The officials said that the Federal Technology Transfer Act of 1986 is intended to encourage U.S. businesses to collaborate with federal laboratories on research. However, unless a business pays all of the costs, the research is non-proprietary and the public, and particularly competing businesses, can get access to research results through the Freedom of Information Act. As a result, many potential collaborations do not occur and the scope of work is scaled back for some of the projects that are negotiated. Several laboratory and agency officials propose that federal laboratories be given the authority to treat the research results of a collaboration as a company trade secret for a period of up to 5 years.

Officials at three of Energy's contractor-operated laboratories told us that their ability to license inventions is constrained because they are required to obtain a waiver of Energy's title rights to the inventions, which creates uncertainty and delay and thus reduces industry's interest in getting involved. In February 1987 Energy sent a proposed regulation to the Office of Management and Budget that would permit the large business contractors of its laboratories to elect to retain rights to certain classes of inventions. However, the proposed regulation is still under review because of the Department of Commerce's concern that it is too restrictive. Energy officials also stated that technology transfer from its three weapons laboratories is legislatively constrained because the research may involve classified or sensitive information, but added that Energy is studying options for improving technology transfer from these laboratories.

Finally, federal laboratory and agency officials recognize that the laboratories must be fair in providing businesses

the opportunity to collaborate on research. However, federal technology transfer officials are concerned that industry interest is likely to be inhibited if the laboratories institute burdensome and time-consuming procedures for entering into a cooperative research agreement. As an example of how to deal with these concerns, officials at the National Bureau of Standards, which has run a collaborative research program with industry for many years, stated that the Bureau publicizes opportunities in broad fields of technology and then negotiates with potential collaborators for specific research projects on a first-come-first-served basis, provided that the proposed research furthers the Bureau's mission.

Section 1 of this briefing report provides background information and more details about our objectives, scope, and methodology. Sections 2, 3, 4, and 5 provide information about each of the perceived constraints. Appendix I lists the major contributors to this briefing report.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this briefing report until 14 days from the date of this letter. If you have further questions, please contact me at (202) 275-8545.

Sincerely yours,

Flora H. Milans

Flora H. Milans
Associate Director

CONTENTS

ABBREVIATIONS

OMB	Office of Management and Budget
NASA	National Aeronautics and Space Administration
R&D	research and development

SECTION 1

INTRODUCTION

In recent years concern has grown about the U.S. trade deficit and the ability of U.S. businesses to compete in world markets. In response to these concerns, the administration and the Congress have acted to strengthen the links between the nation's research and technology base and U.S. industry. In fiscal year 1987 the government spent about $56 billion on research and development (R&D), about 50 percent of all U.S. R&D expenditures.

One means to increase U.S. industry's access to federally funded technology is through improved technology transfer from federal laboratories, which spent about $20 billion on R&D in fiscal year 1987. Beginning with the passage of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3701 et seq.) and the Patent and Trademark Amendments of 1980 (35 U.S.C. 200 et seq.), the Congress has passed several laws and President Reagan has taken executive actions to enable federal laboratories to more effectively transfer technology to U.S. businesses by collaborating on R&D and licensing inventions.

In general, the legislative and executive actions distinguish between government-operated federal laboratories, which have federal employees, and contractor-operated federal laboratories, which are operated by nonprofit organizations or businesses under a contract with the federal government and whose employees are not federal workers. The thrust of the actions for government-operated laboratories has been to permit them to collaborate on R&D with industry and to stimulate their efforts to license inventions. The thrust for contractor-operated laboratories has been to permit the contractors to retain title rights to inventions and technical data without requesting a waiver of the government's rights to this intellectual property.

GOVERNMENT-OPERATED FEDERAL LABORATORIES

The Stevenson-Wydler Act took a first step to improve the utilization of federally funded technology by directing all federal laboratories to establish an office of research and technology applications to disseminate information about federal products, processes, and services. The Patent and Trademark Amendments of 1980 encouraged the licensing of government-operated laboratory inventions by authorizing federal agencies to grant exclusive and partially exclusive licenses if the agency determines that it is appropriate and in the public interest.

The Federal Technology Transfer Act of 1986 (P.L. 99-502, Oct. 20, 1986) amended the Stevenson-Wydler Act to authorize federal agencies to permit their government-operated laboratories to collaborate on R&D with other organizations, including businesses,

through a cooperative R&D agreement. The intent of the act is to make the entering of these agreements as easy as possible from the point of view of the private sector participant, while protecting the legitimate concerns of the government. Under the act, a laboratory can grant a collaborator title or licensing rights to any resulting invention; but if the collaborator takes title to an invention, the government retains a royalty-free license for its use by or on behalf of the government. The act also provides incentives to federal employees to promote technology transfer by directing federal agencies to (1) pay an employee inventor at least 15 percent of any royalties or other income received, up to $100,000 per year, for an invention and (2) establish a cash awards program for inventions, innovations, or other outstanding scientific or technological contributions of value to the United States due to commercial application or contributions to the missions of the agency or government.

In April 1987 President Reagan issued Executive Order 12591, "Facilitating Access to Science and Technology." The order implements the Federal Technology Transfer Act by directing the heads of federal agencies to delegate authority to their government-operated federal laboratories to enter into cooperative R&D agreements and license, assign, or waive rights to intellectual property, which would include inventions and computer software that the laboratory develops.

CONTRACTOR-OPERATED FEDERAL LABORATORIES

Before 1980 the government had the option to retain title rights to all inventions resulting from federally funded research and development, although these rights could be waived under certain conditions. The Patent and Trademark Amendments of 1980 gave small business and nonprofit contractors and grantees the right, with few exceptions, to retain title to federally funded inventions that they make. Public Law 98-620, enacted in November 1984, amended the act by extending its coverage to most of the Department of Energy's laboratories that are operated by nonprofit organizations. However, it specifically excluded Energy's laboratories that are primarily dedicated to naval nuclear propulsion or weapons-related programs, because much of their R&D involves classified or sensitive information.[1]

In February 1983 President Reagan issued a memorandum to the heads of all federal agencies that directs them, to the extent

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[1]For more information about federal agencies' implementation of the Patent and Trademark Amendments of 1980, see Patent Policy: Recent Changes in Federal Law Considered Beneficial (GAO/RCED-87-44, Apr. 16, 1987) and Energy Management: Effects of Recent Changes on DOE Patent Policies (GAO/RCED-87-5, Dec. 31, 1986).

permitted by law, to give all federal contractors and grantees the option to retain title rights to resulting inventions. President Reagan further formalized the 1983 memorandum by including similar language in his April 1987 executive order.

OBJECTIVES, SCOPE, AND METHODOLOGY

The Chairman, House Committee on Science, Space and Technology, asked us to identify constraints to transferring technology from federal laboratories to U.S. businesses to assist the Committee's Task Force on Technology Policy.

The information in this report reflects the perceptions of senior research managers and technology transfer officials at 10 federal laboratories and program managers and/or patent counsels at 6 federal agencies. (See table 1.1.) We selected the laboratories because (1) they are among the largest in each of six federal agencies, with a total operating R&D budget of $5 billion in fiscal year 1986 and (2) their research could have important commercial applications. The sample included six government-operated and four contractor-operated laboratories. Some of the laboratories have had active programs in transferring technology to U.S. industry and some had little interaction with U.S. industry before the Federal Technology Transfer Act was enacted. We did not interview executives from businesses or trade associations to discuss their perceptions about opportunities to better use federal laboratory R&D and constraints to technology transfer.

We visited 8 of the 10 federal laboratories to obtain research managers' and technology transfer officials' perceptions on technology transfer constraints. At each laboratory, we talked with from 6 to 15 research managers and technology transfer officials. We also talked by telephone with technology transfer officials at the two other laboratories. We then interviewed program managers and/or patent counsels at the six federal agencies to obtain their perceptions about constraints to transferring technology from their laboratories to U.S. industry. We conducted the audit work between August 1987 and February 1988.

On the basis of the laboratory and agency interviews, we identified four constraints in transferring technology from federal laboratories to U.S. businesses. The following four sections discuss each of these constraints. These discussions are not intended to apply to R&D that is either classified or sensitive, but rather to unclassified R&D that could be published in the scientific literature.

Table 1.1: Federal Laboratories in Our Study

(Dollars in Millions)

Laboratory	Federal agency	Operating R&D budget in FY 1986
Beltsville Agricultural Research Center	Agriculture	$ 72
National Bureau of Standards	Commerce	174
Lincoln Laboratory[a]	Defense-Air Force	308
Wright Aeronautical Laboratories	Defense-Air Force	945
Naval Research Laboratory	Defense-Navy	401
Oak Ridge National Laboratory[b]	Energy	455
Sandia National Laboratories[c]	Energy	1,000
Lawrence Livermore National Laboratory[d]	Energy	822
National Institutes of Health	Health and Human Services	605
Langley Research Center	NASA	203

[a]Contractor-operated laboratory run by the Massachusetts Institute of Technology.

[b]Contractor-operated laboratory run by Martin Marietta Energy Systems, Inc.

[c]Contractor-operated laboratory run by AT&T Technologies, Inc.

[d]Contractor-operated laboratory run by the University of California.

SECTION 2

AUTHORITY TO COPYRIGHT AND LICENSE COMPUTER SOFTWARE

The Stevenson-Wydler Act, the Federal Technology Transfer Act, and the Patent and Trademark Amendments of 1980, as amended, are intended to stimulate U.S. technology and industrial innovation through the transfer of technology from federal laboratories to U.S. businesses. Federal agencies are authorized to patent and give exclusive licenses to government-operated laboratory inventions, and most of the contractor-operated laboratories can elect to retain rights to inventions that they make with federal funds. However, while this legislation changed federal law for inventions, it did not address the rights to computer software, which is considered technical data and normally cannot be patented.

Businesses typically copyright computer software or treat it as a company trade secret.[2] However, longstanding federal copyright law (17 U.S.C. 105) states that copyright protection is not available for any federal government work, and federal policy has been to publicly disseminate unclassified and nonsensitive technical data.[3] In April 1987 President Reagan partially changed this policy through his Executive Order, "Facilitating Access to Science and Technology," which directs federal agencies, to the extent permitted by law, to permit federal contractors and grantees to retain rights to computer software and other technical data. In this regard, the Federal Technology Transfer Act (15 U.S.C. 3710) directs the Secretary of Commerce to report to the President and the Congress on any copyright provisions or other types of barriers that restrict the transfer of federally funded computer software to the private sector and to state and local governments. Commerce plans to issue its report by April 1988.

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[2]Copyright is a form of protection provided by U.S. law to authors of "original works of authorship" including literary, dramatic, musical, artistic, and certain other intellectual works. The authors can register their work at the Copyright Office in the Library of Congress.

[3]Software is made available through the Department of Commerce's National Technical Information Service, the Department of Energy's National Energy Software Center at Argonne National Laboratory, or the National Aeronautics and Space Administration's (NASA) Computer Software Management and Information Center at the University of Georgia. Other technical data is publicly disseminated through publishing in the scientific literature or through a federal laboratory's or agency's technical publications, such as NASA's Tech Briefs.

GOVERNMENT-OPERATED FEDERAL LABORATORIES

Research managers and technology transfer officials at four government-operated laboratories and program officials and/or patent counsels at five federal agencies support amending federal copyright law to permit federal agencies to copyright and license computer software. The laboratories are the Langley Research Center, Naval Research Laboratory, Wright Aeronautical Laboratories, and National Institutes of Health, and the agencies are NASA and the Departments of Agriculture; Commerce; Defense (Army, Navy, and Air Force); and Health and Human Services. The officials support amending federal copyright law for the following reasons:

-- No apparent reason exists for treating federal laboratory inventions and computer software differently. Both are commercially valuable technology that should be effectively transferred to U.S. businesses.

-- As with patenting and licensing inventions, the most effective way to transfer computer software in many cases is by copyrighting and exclusively licensing it. Langley officials noted that many federal laboratories' computer software programs are not readily usable for commercial applications. As an example, they stated that a NASA contractor that developed NASTRAN computer software for NASA has been more effective than NASA's Computer Software Management and Information Center in distributing the software, even though the center makes NASA software available to U.S. businesses at a nominal cost. This is because the NASA contractor has serviced and enhanced the NASTRAN software to make it more readily usable. A Wright official said that the prohibition on federal copyrighting had inhibited Wright's efforts to transfer software on several occasions.

-- Federal employees do not have the same incentive to develop and refine software for commercial applications as they do to make and improve inventions. The Federal Technology Transfer Act directs federal agencies to give federal employee inventors at least 15 percent of any royalties or other income they receive. In contrast, a federal employee who develops computer software is not entitled to any royalty income. Officials cited several cases in which a federal employee had developed software with important commercial uses. In one case, a company obtained federal software and, with some minor enhancements, sold it without paying royalties to the federal agency or the employee who developed it.

Officials at the National Bureau of Standards and the Beltsville Agricultural Research Center and Energy do not oppose

changing federal copyright law, but do not perceive it as a constraint to their technology transfer efforts. Bureau officials stated that they do not seek to transfer computer software to U.S. businesses. Rather, the Bureau mainly transfers know-how about using and integrating software by having researchers work at its laboratories. Beltsville Agriculture Research Center managers told us that they do not develop much computer software in their research work, so copyrighting is not an issue. Energy officials said that federal copyright law is not a constraint because Energy mainly uses contractor-operated laboratories, which, as nongovernment entities, are permitted to copyright their works.

Patent counsels at Agriculture, Commerce, Army, Navy, Air Force, Health and Human Services, and NASA support changing federal copyright law to permit the federal government to copyright and exclusively license computer software, and see no significant problems in doing so. Energy's patent counsel noted that federal computer software may not be as readily available to the public as it is now under the policy to publicly disseminate federal software because (1) the Copyright Office requires a registrant to deposit only the first and last 25 pages of a computer software program and (2) companies that license and market computer software generally make only the machine-readable (object) code available to users, and do not provide the source code, which is needed to readily make improvements or changes to the software. Other patent counsels noted, however, that individuals or organizations may be able to get access to the object and source codes for federal software through a Freedom of Information Act request.

CONTRACTOR-OPERATED FEDERAL LABORATORIES

Sandia National Laboratories, Oak Ridge National Laboratory, and Lawrence Livermore National Laboratory officials stated that their ability to transfer computer software to U.S. businesses is limited by Energy's statutory authority and policies, which direct the laboratories to publicly disseminate unclassified scientific and technical information.[4] They propose that they be permitted to retain title rights to software that they develop.

Because the software is available to everyone, individual software companies have little incentive to commercialize it. The laboratory officials noted that much of their software is complex,

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[4]Sandia technology transfer officials also said that they are constrained in transferring semiconductor chip mask works, which the Semiconductor Chip Protection Act of 1984 (17 U.S.C. 901 et seq.) states are eligible for copyright protection. Energy's statutory authority includes the Atomic Energy Act of 1954 (42 U.S.C. 2013, 2051, and 2161), the Energy Reorganization Act of 1974 (42 U.S.C. 5813), and the Department of Energy Organization Act (42 U.S.C. 7112).

with as many as 100,000 lines of code, and businesses cannot readily use the software for commercial applications without a substantial investment of time and resources. According to the officials, giving a company an exclusive license for the software is more effective than making it publicly available in many cases because the exclusive license provides the company the means to recover its investment in refining and servicing the software.

The officials cited as an example the successful transfer of software that Lawrence Livermore exclusively licensed to Control Data Corporation in July 1986. Under the licensing arrangement, Control Data is (1) debugging and simplifying the software to ensure that it works properly, (2) enhancing it for different commercial applications, and (3) developing manuals and providing assistance to users. Control Data will pay royalties to Lawrence Livermore and provide the government access to enhanced versions of the software.

In addition, Sandia, Oak Ridge, and Lawrence Livermore officials and Energy's Director of International Security Affairs noted that Energy's statutory authority to publicly disseminate unclassified scientific and technical information does not distinguish between U.S. and foreign businesses. These officials stated that computer software should be considered as commercially valuable technology to which foreign competitors should not have equal access through public dissemination.

Our report on the National Energy Software Center showed that from October 1985 through March 1987, the center distributed 2 or more copies of 41 scientific and engineering software programs to U.S. organizations and 2 or more copies of 24 scientific and engineering software programs to foreign organizations.[5] Overall, the center distributed 1 or more copies of 109 scientific and engineering software programs to foreign organizations during the 18-month period. The National Energy Software Center does not announce the availability of new software to foreign organizations for 2 years after it is announced to U.S. organizations. However, the center sells source code, which is needed to readily improve the software, to both U.S. and foreign organizations for a nominal fee, if the code is available and the sale is in compliance with the Export Control Act.[6] An Energy program official stated that the center primarily distributes technical scientific software that has little commercial value.

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[5]Software Distribution: Review of the Department of Energy's National Energy Software Center (GAO/IMTEC-88-2, Oct. 14, 1987).

[6]The National Technical Information Service similarly makes source code available to foreign businesses. NASA distributes only machine-readable object code to foreign requesters.

Energy's Assistant General Counsel for Patents stated that, in response to President Reagan's April 1987 Executive Order, Energy is developing a software policy that will permit its contractor-operated laboratories to retain title to computer software in certain circumstances by requesting Energy to waive its title rights. Because the thrust of the executive order regarding computer software and other technical data is in conflict with Energy's authorizing legislation, which directs Energy to publicly disseminate scientific and technical information, the Assistant General Counsel suggested that it may be appropriate for the Congress to legislatively address federal contractors' rights to software and other technical data.

Similar to Energy's statutory authority, the National Aeronautics and Space Act (42 U.S.C. 2473) directs NASA to provide for the widest practicable and appropriate dissemination of information about its activities. In December 1987 NASA revised its supplement to the Federal Acquisition Regulation to establish a waiver process for its contractors, including its contractor-operated laboratory, to copyright computer software if (1) the contractor or a licensee intends to incorporate the software into an existing or new commercial computer software product line, (2) the contractor has or will make significant contributions to the development of the software, or (3) if NASA's Director, Technology Utilization Division, or another designated official approves. NASA's Associate General Counsel for Intellectual Property Law stated that NASA supports the thrust of the executive order, but NASA is legislatively constrained from permitting contractors to retain rights in other circumstances.

Lincoln Laboratory officials were not concerned about transferring computer software to U.S. businesses because Lincoln primarily conducts classified research for the Air Force and other Defense organizations. Normally, Lincoln researchers interact with the Defense sponsors and have little contact with Defense contractors. Because of the sensitivity of the classified research, they have few interactions with other U.S. businesses.

SECTION 3

PROPRIETARY RESEARCH

Research managers and technology transfer officials we interviewed at many of the federal laboratories stated that the most effective mechanism for technology transfer is through "shoulder-to-shoulder contact" by federal laboratory researchers collaborating on R&D with industry and university researchers. Government-operated federal laboratories currently are implementing the Federal Technology Transfer Act, which authorizes them to enter into cooperative R&D agreements with businesses, universities, and other organizations. The act directs laboratory directors to give preference to U.S.-based business units that agree to substantially manufacture in the United States the technology from any resulting inventions. However, because federal laboratories generally cannot conduct proprietary research, industry is less inclined to enter into collaborative efforts.

LIMITED OPPORTUNITIES FOR CONDUCTING PROPRIETARY RESEARCH AT FEDERAL LABORATORIES

The results of unclassified and nonsensitive R&D conducted at federal laboratories normally are published in the scientific literature and/or result in a patent application. While the publication of R&D results may be delayed for a short time, federal laboratory and agency officials stated that the intent is to publicly disseminate the results because (1) publication furthers the mission of the laboratories and (2) their researchers gain recognition among peers through publication.

According to agency officials, a business can fund proprietary R&D at federal laboratories only if it pays all of the direct and indirect costs. In most cases, such R&D involves the use of expensive and unique research facilities, such as wind tunnels or synchrotron light facilities. The Department of Energy also permits proprietary research through its work-for-others program, provided the business pays all of the associated costs.

In addition to obtaining the results of federal R&D through published scientific literature, interested parties can get information about federally funded research through a request under the Freedom of Information Act. The act requires federal agencies to make records promptly available to any person upon a request for records that (1) reasonably describes such records and (2) is made in accordance with published rules.

Exceptions to disclosure of research-related information under the act are limited. They include classified information and company trade secrets. Other statutes provide additional authority for federal agencies to withhold specific research-related information. For example, the Patent and Trademark Amendments of

1980 (35 U.S.C. 205) authorize federal agencies to withhold from disclosure information about an invention that is likely to result in a patent application. Under 10 U.S.C. 130(a), the Secretary of Defense is authorized to withhold from public disclosure Defense technical data with military or space application if the data are subject to approval procedures under the Export Administration Act of 1979 or the Arms Export Control Act. The National Defense Authorization Act for Fiscal Years 1988 and 1989 (15 U.S.C. 4606) also excludes from disclosure information that the federal government obtains on a confidential basis through its involvement in the Sematech semiconductor cooperative research program.

BUSINESSES SEEK CONFIDENTIALITY

Research managers and technology transfer officials at seven federal laboratories and program officials and/or patent counsels at four agencies stated that federal laboratories' limited authority to conduct proprietary R&D is a constraint to technology transfer. The laboratories are the National Bureau of Standards, Wright Aeronautical Laboratories, Naval Research Laboratory, Oak Ridge National Laboratory, Sandia National Laboratories, Lawrence Livermore National Laboratory, and Langley Research Center; the agencies are Commerce, Defense (Army, Navy, and Air Force), Energy, and NASA. The officials said that confidentiality of company data and research results normally are among the first issues businesses raised in exploring opportunities to collaborate on R&D. Because federal laboratories cannot restrict public, and particularly competing businesses', access to the R&D results, many potential collaborations do not occur and the scope of work is scaled back for some of the agreements that are negotiated.

National Bureau of Standards, Langley Research Center, Wright Aeronautical Laboratories, Naval Research Laboratory, Lawrence Livermore National Laboratory, Army, Air Force, Commerce, and Energy officials suggested changing federal law to authorize federal laboratories to

-- conduct proprietary R&D under a cooperative R&D agreement for government-operated laboratories, or under a similar arrangement for contractor-operated laboratories, and

-- treat the R&D results as a company trade secret for up to 5 years, depending on the specific research project and the field of technology.

These officials stated that the intent of the Federal Technology Transfer Act to encourage U.S. businesses to make better use of federal laboratories would be more fully achieved if U.S. industry could conduct cooperative R&D that is proprietary. However, many of them were concerned about extending the coverage of proprietary research to include other non-collaborative federal R&D because it

would likely affect the federal laboratories' missions and the open and collegial exchanges among the laboratories' researchers.

Officials at Sandia National Laboratories, Oak Ridge National Laboratories, NASA, and Navy suggested giving federal agencies broader authority to restrict access to any federal laboratory R&D results that are commercially valuable. In general, these officials cited concerns about foreign competitors and the need to enhance the competitiveness of U.S. industry. In addition, Sandia and Oak Ridge officials said that technology transfer would be more effective in some instances if federal laboratories could give U.S. businesses nonpatentable trade secrets; NASA patent counsels stated that it is essential to exclude the space station program from the Freedom of Information Act; and Navy patent counsels mentioned the need to protect the intellectual property rights of Navy contractors as well as businesses that collaborate on R&D at a federal laboratory.

CONCERNS ABOUT CONDUCTING PROPRIETARY RESEARCH

Research managers and technology transfer officials at the Beltsville Agricultural Research Center and the National Institutes of Health and officials at Agriculture stated that their laboratories have only recently started to collaborate with businesses on R&D, so that conducting proprietary research has not been a concern for them. Many of the officials said that they do not want to conduct proprietary R&D because (1) their laboratories operate around a philosophy of a free and open discussion of scientific ideas and (2) conducting proprietary R&D might inhibit the informal exchange of ideas among researchers and consequently affect the laboratories' primary missions to improve health and agriculture.

Program officials at Health and Human Services stated that they have not resolved conflicting concerns about amending the Freedom of Information Act to better protect proprietary research. They noted philosophical problems of conducting proprietary R&D at the National Institutes of Health, but they also acknowledged the problem of entering into cooperative R&D agreements without providing businesses more protection from competitors' requests for research-related information under the Freedom of Information Act. The officials stated that Health and Human Services has sought to exclude the Food and Drug Administration's activities related to approving new drugs because of the large number of requests from competing businesses for disclosure of information about a proposed new drug.

Officials at Lincoln Laboratory were not concerned about conducting proprietary research. Because most of the R&D is classified, cooperative R&D with U.S. businesses is not considered appropriate.

SECTION 4

DECENTRALIZING TECHNOLOGY TRANSFER AUTHORITY

The Patent and Trademark Amendments of 1980, as amended, have divided the Department of Energy's contractor-operated laboratories into three categories for purposes of technology transfer:

1. Energy's research laboratories operated by universities, such as Argonne National Laboratory or Brookhaven National Laboratory, are authorized to elect to retain title to almost all inventions that they make.

2. Energy's research laboratories operated by large businesses, including Oak Ridge National Laboratory and Idaho National Engineering Laboratory, are not covered by the act. However, these laboratories are covered by President Reagan's February 1983 memorandum and April 1987 executive order, which direct federal agencies, to the extent permitted by law, to give all federal contractors the rights that the Patent and Trademark Amendments of 1980 gave to nonprofit and small business grantees and contractors.

3. Energy's contractor-operated laboratories that are primarily dedicated to naval nuclear propulsion or weapons-related research, including Sandia National Laboratories and Lawrence Livermore National Laboratory, are specifically excluded by the act from taking title to inventions that they make without obtaining Energy approval through a waiver of rights.

Research managers and technology transfer officials at Oak Ridge National Laboratory stated that their technology transfer efforts are constrained because, unlike university operators of Energy's research laboratories, Oak Ridge cannot elect to retain title to inventions that it makes. Instead, Oak Ridge is required to request a waiver of Energy's invention rights on a case-by-case basis. The officials said that the invention waiver process constrains technology transfer to U.S. businesses because (1) it creates uncertainty about whether Energy will waive its title rights and (2) the time delays in obtaining Energy's waiver approval reduces businesses' interest in licensing Oak Ridge inventions.

Energy's Assistant General Counsel for Patents stated that Energy drafted proposed regulations that would waive Energy's rights in advance to classes of inventions that were made by its large business contractors. Energy sent the proposed regulations to the Office of Management and Budget's (OMB) Office of Information and Regulatory Affairs in February 1987 for concurrence. OMB is still reviewing the proposed regulations in

light of concerns raised by Commerce that the proposed regulations are too restrictive in waiving rights to Energy's large business contractors.

Research managers and technology transfer officials at Sandia and Lawrence Livermore stated that their technology transfer activities are constrained because they are required to request Energy's approval for (1) retaining title rights to most of their inventions and other intellectual property, (2) entering into work-for-others agreements, and (3) entering into collaborative R&D agreements that provide some kind of exclusivity. According to Sandia and Lawrence Livermore officials, Energy's review of these technology transfer activities can take several months, resulting, in many cases, in a business' losing interest in working with the laboratory. Energy officials' goal is to provide a response to the laboratories within 6 weeks for a patent waiver request.

Lawrence Livermore and Energy officials noted that in September 1987 Energy renewed its contract with the University of California to operate Lawrence Livermore. Under the revised contract, the University of California can elect to take title to inventions that are funded by Energy's civilian energy programs, but it must continue to request a waiver of title rights to inventions that are funded by Energy's defense programs.[7]

Energy's Assistant General Counsel for Patents stated that Energy is concerned about giving naval nuclear propulsion and weapons-related laboratories the right to elect title to defense programs-funded inventions because

-- Energy gives management at these laboratories a great deal of discretion for implementing their missions, and it is concerned that technology transfer might bias the mission.

-- Energy is concerned that sensitive information related to nuclear nonproliferation could have related commercial applications and thus may be disclosed through technology transfer.

-- The weapons-related laboratories primarily deal with nuclear weapons technology that can involve classified and sensitive information; therefore, a case-by-case review is more appropriate for allowing them to take title to this technology.

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[7]For an invention made through R&D funded by another federal agency, the University of California can request that Energy determine whether the university can elect title or whether it must request a waiver.

Sandia's and Lawrence Livermore's management stated that they are aware of Energy's concerns and that their first priority is to work with Energy's defense programs management to fulfill its weapons-related mission. Sandia and Lawrence Livermore officials noted that articles for publication by their researchers are reviewed by line managers and a classification office for classified or sensitive information. In addition, the U.S. Patent and Trademark Office reviews patent applications for classified or sensitive information and does not issue patents for classified inventions. Sandia officials also suggested that Energy could place limits on the amount of any royalty income the laboratories receive and the purposes for which it can be used that are similar to the limitations in the Patent and Trademark Amendments of 1980, as amended, (35 U.S.C. 202(c)(7)(C) and (E)).

Sandia and Lawrence Livermore have requested that Energy give them the authority to enter into work-for-others and collaborative R&D agreements for up to $1 million without obtaining Energy's approval. According to a Lawrence Livermore official, delegation of this authority would greatly assist Lawrence Livermore's technology transfer efforts.

Energy's acting Assistant Secretary for Defense Programs has asked the Director for International Security Affairs to develop a proposal for improving technology transfer from Energy's three weapons-related laboratories (Sandia, Lawrence Livermore, and Los Alamos National Laboratory). The Director for International Security Affairs is concerned about the nation's national security from an economic as well as national defense perspective and believes that the weapons-related laboratories can help U.S. industry better compete in world markets. To improve the technology transfer abilities of these laboratories, he is considering (1) ways to address Energy's legal and classification concerns while minimizing delays to technology transfer and (2) the need for legislation to give the laboratories more authority and better means to transfer technology.

SECTION 5

FAIRNESS IN ENTERING INTO A COOPERATIVE R&D AGREEMENT

Research managers and technology transfer officials at the National Institutes of Health and the Beltsville Agricultural Research Center expressed concern that they treat competing businesses fairly when entering into a cooperative R&D agreement. Because they had little interaction with businesses before the Federal Technology Transfer Act was enacted, the laboratories do not have procedures in place for determining to what extent they will notify businesses about potential collaborative research opportunities. Their concern is that after they have entered into a cooperative R&D agreement with a business, a competitor may claim, either legitimately or for the purpose of tying up the collaboration, that he was not offered a similar opportunity to collaborate.

Research managers and technology transfer officials at all of the federal laboratories shared the concern that businesses have a fair opportunity to collaborate on R&D. In addition, they were concerned that they achieve the intent of the Federal Technology Transfer Act, which is to stimulate collaborative research between businesses and federal laboratories. They stated that burdensome procedures and time delays are major constraints to entering into a cooperative R&D agreement with businesses, and they noted that the act's definition of a cooperative R&D agreement specifically states that it is not a procurement contract or cooperative agreement.

None of the federal laboratory officials we interviewed proposed publishing specific research opportunities in the Federal Register or Commerce Business Daily on a routine basis. However, a Department of Agriculture official said that the agency may advertise a particular research opportunity in the Federal Register on an exception basis, and a Health and Human Services official suggested that the agency may adapt the National Institutes of Health grant award mechanism. An Energy official said that Energy may issue a directive to its laboratories for ensuring fairness in the process of collaborating with businesses.

The National Bureau of Standards has collaborated with U.S. industry for many years through informal arrangements and formal agreements with businesses. Bureau officials notify U.S. businesses about opportunities to collaborate in broad fields of technology, and then they negotiate with potential collaborators for specific research projects on a first-come-first-served basis, provided that the proposed research furthers the Bureau's mission. The Bureau officials said that to advertise, negotiate, and award specific opportunities would be too cumbersome. Many businesses that might be willing to collaborate on R&D would quickly lose interest. They also said that it would not be fair to a potential collaborator if the Bureau advertised a research opportunity that

was based on the collaborator's idea. If another company approaches the Bureau about collaborating on research for which they already have an ongoing agreement, the officials said that they try to provide an opportunity to collaborate in a related area of interest.

APPENDIX I

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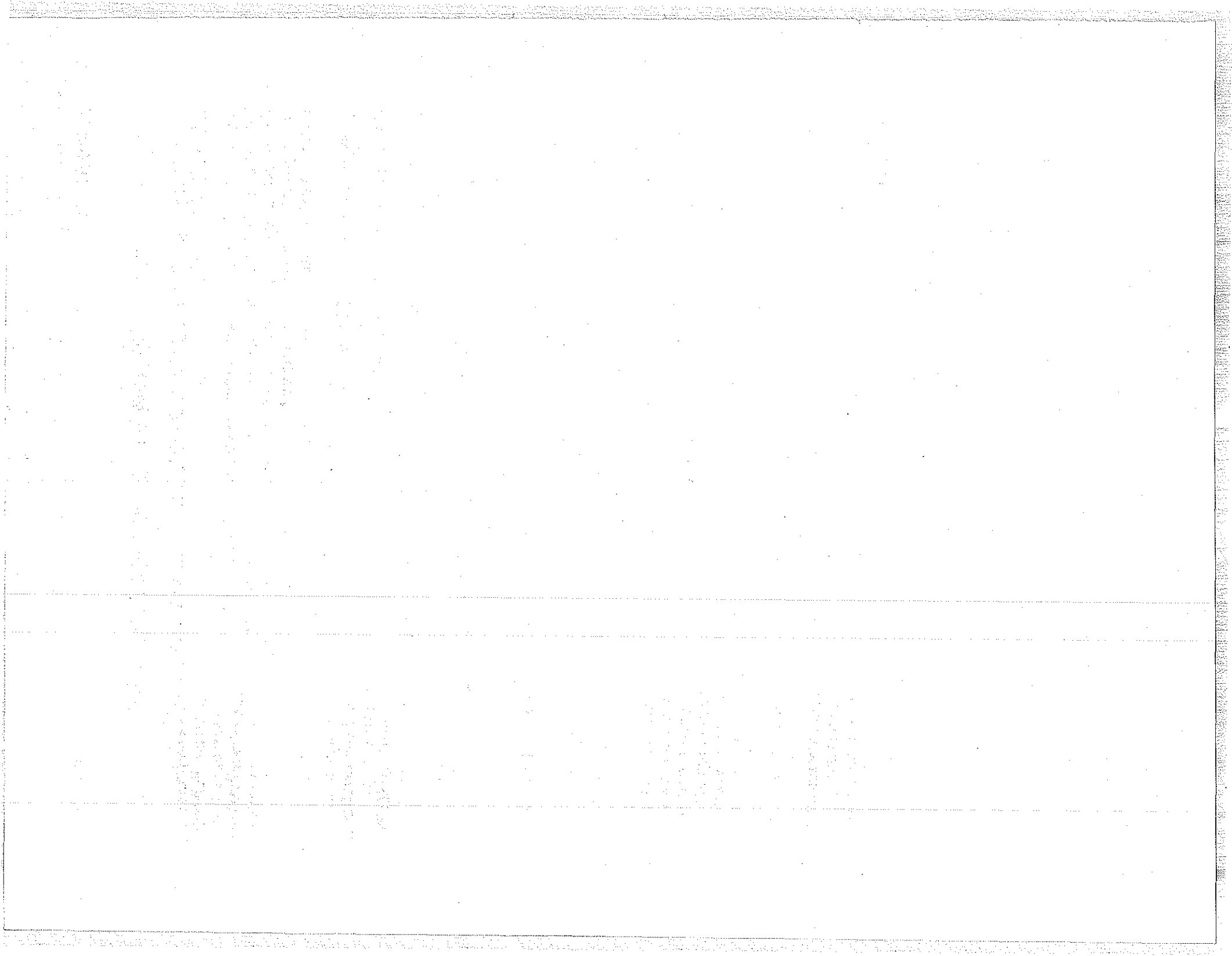

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