

3. IMPROVING PUBLIC ACCESS TO FEDERAL STI

Question 3.

How can the Federal Government improve public access to its resources of STI?

During the 1980s, the Office of Management and Budget (OMB) has been the dominant force in setting policy on dissemination of Federal information—including Federal STI. OMB policy had been interpreted (whether intended or not) as discouraging Federal agencies from using electronic dissemination to facilitate public access to agency information. OMB was especially adamant that Federal agencies not disseminate so-called “value-added” information, that is, anything beyond the raw data such as indexing or search and retrieval capability. OMB viewed electronic dissemination of Federal information as primarily a private sector rather than governmental function. In Informing the Nation, OTA pointed out that OMB policy appeared to be inconsistent with agency information programs and missions established by statute as well as with general statutory principles of open government.¹ Restricting the Federal science agencies from providing value-added information, or from providing such information in electronic form, would erode their ability to carry out statutory responsibilities. Such restrictions also would prevent the science agencies from passing on to STI users the value-added benefits of electronic technologies included in agency R&D and automation programs (and paid for with taxpayer dollars).

OMB policy direction appears to have recently shifted to a more balanced position—one that recognizes the legitimate role of Federal agencies in electronic dissemination as well as the private sector’s role in supplementing and complementing agency dissemination. Nonetheless, the history of this policy debate strongly suggests the need for congressional direction. The absence of clear congressional guidance contributed to years of controversy over information dissemination policy, and resulted in significant time

and dollar costs to the government and various interested parties in seemingly endless debate over statutory interpretation and legislative intent. Even more importantly, the absence of clear congressional guidance hindered the ability of the government—including Federal science agencies—to fully realize the significant opportunities for cost-effective improvements in overall public access to Federal information. For example, in the case of the National Technical Information Service (NTIS), OMB’s insistence on privatization, which was later overruled by Congress, might have resulted in a 2 or 3 year delay in NTIS modernization.

Public access to Federal STI has been further complicated by the ongoing debate about the need for restrictions on STI to protect national security, promote international competitiveness, or encourage domestic innovation. How can or should these needs be reconciled with the basic commitment in the United States to the free flow of STI, especially STI that has been developed or collected at taxpayer expense? Finally, public access to Federal STI has been caught in the middle of the debate over the roles of individual Federal science agencies and governmentwide agencies such as NTIS and the Government Printing Office (GPO) in information dissemination. For example, while many concur in the need for a governmentwide directory to Federal STI, an implementation plan has not yet been developed and agreed to.

An overall strategy on improving access to Federal STI needs to address at least the following areas: basic principles of STI dissemination; basic policy on the free flow of STI; technical standards and directories for ST I dissemination; and respective roles of the individual science agencies and governmentwide dissemination and archival agencies. (Other aspects of an overall strategy are discussed in chapter 4 on interagency coordination.)

1U. S. OTA, Informing the Nation, op. cit., ch.11.

Principles of STI dissemination. OMB and its directives on information dissemination take on great importance in the absence of governmentwide policy for STI. The OMB role was strengthened through enactment of the Paperwork Reduction Act of 1980,² which established an Office of Information and Regulatory Affairs (OIRA) within OMB. The Act was amended in 1986 to include information dissemination within its scope.³ However, Congress did not provide statutory guidance on the shape, direction, or even basic philosophy of information dissemination that might be promulgated by OIRA.

OMB's efforts during the 1980s to promulgate information dissemination policy have proved to be very controversial.⁴ Much of the controversy has focused on the role of the private sector in and user charges for Federal information dis-

semination. Both the draft and final 1985 versions of OMB Circular A-130 on "Management of Federal information Resources" emphasize that Federal agencies place "maximum feasible reliance" on the private sector for information dissemination, and that costs be recovered through user charges where appropriate.⁵

This OMB policy direction could have accelerated if A-130 went unchanged and Federal agencies issued their own departmental regulations to implement A-130. The Department of Commerce is a case in point, and is particularly important since several Commerce agencies have major STI functions (e.g., NTIS, NOAA, National Institute of Standards and Technology (NIST), and the Patent and Trademark Office).

The basic thrust of the August 1988 draft Commerce policy was that "[operating units will use private sector firms to develop, manage, and operate electronic dissemination activities to the maximum extent possible, " and that, "before initiating electronic information dissemination, operating units will conduct a privatization analysis." The proposed policy placed the burden of proof on the agency to "justify any proposed direct Federal role in disseminating electronic information in terms of overriding public need, law, and/or program mission." The burden was particularly heavy with respect to the development and dissemination of value-added electronic information products and services, and in general the marketing and distribution of agency information—all functions which the Department felt should be carried out primarily by the private sector. The Department, in its own highlights sheet, noted that, as a standard of performance, Commerce's electronic dissemination activities should "[o]ffer no value-added features." Likewise, the draft policy placed the burden of proof on the agency to justify why fees to recover the actual costs of dissemination should not be applied.⁶

²P. L. 96-511, December 11, 1980.

³P. L. 99-500, October 18, 1986, and P.L. 99-591, October 30, 1986.

⁴See, for example, McClure and Hennon, U.S. Scientific and Technical Information, op. cit.; C.R. McClure, P. Hennon, and H. Releya, eds., United States Government Information Policies: Views and Perspectives (Norwood, N.J.: Ablex Publishing Corp., 1989); statement of Harold B. Shi 11, Associate Professor, West Virginia University, on behalf of the West Virginia Library Association and West Virginia University Libraries, before a May 23, 1989, hearing of the House Government Operations Subcommittee on Government Information, Justice, and Agriculture; statement of Harold B. Shi 11, on behalf of the American Library Association, Legislative Assembly, before a July 14, 1987, hearing of the House Committee on Science, Space, and Technology, Subcommittee on Science, Research and Technology; U.S. OTA, Informing the Nation, op. cit., ch. 11; and H.C. Releya, J. Bortnick, and R.C. Ehke, Management of Federal Information Resources: A General Critique of the March 1985 OMB Draft Circular (Washington, D.C.: Congressional Research Service, Library of Congress, July 5, 1985). Also see "Librarians Fight Government Plan," New York Times, Feb. 21, 1989, p. A17; J. Markoff, "Giving Public U.S. Data: private Purveyors Say No," New York Times, March 4, 1989, pp. A1, 47; J. Markoff, "Policy Shift on Access to U.S. Data," New York Times, April 10, 1989, pp. 01, D8; D. Sherwood, "Data Wars," Government Executive, April 1989, pp. 24 ff; and C. Webb, "Government Databases: Competing with Private Services?" Presstime, April 1989, pp. 18-20.

⁵U. S. Office of Management and Budget, draft, "Management of Federal Information Resources," Federal Register, Vol. 50, No. 51, March 15, 1985, pp. 10734-10747; U.S. Office of Management and Budget, Circular A-130, "Management of Federal Information Resources," Vol. 50, December 24, 1985, pp. 52730-52751.

Overall, the proposed policy placed so many substantive and procedural hurdles in the path of agency electronic dissemination activities that innovation and creativity could have been seriously impaired. Even though the policy stipulated procedures by which agency components could have justified government electronic dissemination and/or fee waivers, the procedural burden appeared to be high enough to discourage agency initiatives.

In January 1989, OMB issued an "Advance Notice of Further Policy" that was interpreted by many respondents as favoring private sector over government dissemination of Federal information, limiting agency dissemination to basic and not value-added electronic information, and requiring user fees to recover the costs of dissemination, absent compelling reasons to the contrary.⁷ The public comment on the January OMB notice was overwhelmingly critical. OMB concluded that the January draft did not accurately communicate OMB's policy views and had further confused and polarized the debate. As a consequence, on June 15, 1989, OMB issued a "Second Advance Notice of Further Policy Development on Dissemination of Information" that formally withdrew the January 4 notice, summarized the comments received, and presented OMB's reactions and preliminary conclusions.⁸ On June 16, OIRA Administrator Jay Byler announced the withdrawal in testimony before the Senate Committee on Governmental

Affairs, Subcommittee on Government Information and Regulation.⁹ Commerce Department officials subsequently indicated that the draft departmental policy, mentioned earlier, has been placed on indefinite hold and would be subject to further modification and public comment if and when the policy process continues.

The essence and significance of the June OMB notice is captured in the following quotation:

OMB wishes to make clear that its fundamental philosophy is that government information is a public asset; that is, with the exception of national security matters and such other areas as may be prescribed by law, it is the obligation of the government to make such information readily available to the public on equal terms to all citizens; that to the extent the flow of information from the government to the public can be enhanced by the participation of the private sector, such participation should be encouraged; and that participation by the private sector supplements but does not replace the obligations of government. These principles apply whatever the form, printed, electronic, or other in which the information has been collected or stored. OMB did not intend that either OMB Circular A-130 or the January 1989 notice should have the effect of dissuading agencies from carrying out activities they believe are necessary for the proper performance of agency functions...or that Federal agencies or the public should be made to rely primarily on the private sector for the dissemination of government information.

6U. S. Department of Commerce, Draft Department Administrative Order on "Electronic Information Dissemination," August 5, 1988, published in part as "Draft Policy of the U.S. Department of Commerce on the Dissemination of Information in Electronic Format," Government Information Quarterly, Vol. 6., No. 1, 1989, pp. 89-96.

7U. S. Office of Management and Budget, "Advance Notice of Further Policy Development on Dissemination of Information," Federal Register Vol. 54, No. 2, January 4, 1989, pp. 214-220.

8See summary of comments in U.S. Office of Management and Budget, "Second Advance Notice of Further Policy Development on Dissemination of Information," Federal Register, Vol. 54, No. 114, June 15, 1989, pp. 25554-25559; also see J. Markoff, "O.M.B. Proposes Switch in Information Policy," New York Times, June 10, 1989, p. A-28.

9Testimony of Jay Byler, Administrator, OMB Office of Information and Regulatory Affairs, before a June 16, 1989, hearing of the Senate Committee on Governmental Affairs, Subcommittee on Government Information and Regulation. Also see testimony of Jay Byler before a June 28, 1989, hearing of the House Committee on Administration, Subcommittee on Procurement and Printing.

10U. S. OMB, "Second Advance Notice," *op. cit.*, p. 25557.

OMB intends to prepare a new draft policy consistent with the discussion in the June 15 notice. At the same time, various congressional committees are developing legislative proposals to provide OMB with specific statutory guidance on information dissemination. OMB policy and related legislation can be expected to have a significant impact on Federal STI dissemination. These initiatives deserve careful scrutiny to ensure that governmentwide dissemination principles are consistent with those appropriate for STI, and, if not, to make sure that separate guidance is provided for STI. Several key principles need attention:

- strengthening public access to Federal science agency STI;
- providing enhanced or value-added Federal STI products and services when appropriate to agency missions and user needs;
- taking advantage of opportunities to improve the cost-effectiveness of Federal agency STI dissemination;
- encouraging the diversity of avenues for dissemination of Federal STI;
- involving potential users, providers, and contractors in agency planning for STI dissemination;
- determining when and how user charges are applied to Federal STI dissemination;
- defining when and how intellectual property rights extend to Federal STI;
- enhancing the role of the private sector (e.g., libraries, vendors) in Federal STI dissemination; and
- ensuring equitable competitive conditions for contractors and vendors involved in Federal STI.

¹¹ For related discussion, see U.S. Congress, House, Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture, Electronic Collection and Dissemination of Information by Federal Agencies: A Policy Overview, House Report 99-560, 99th Congress, 2nd sess. (Washington, D.C.: U.S. Government Printing Office, April 29, 1986). Also see U.S. Congress, House, Committee on Government Operations, Subcommittee on Government Information and Individual Rights, Government Provision of Information Services in Competition With the Private Sector, Hearing, 97th Congress, 2nd Sess. (Washington, D.C.: U.S. Government Printing Office, February 25, 1982); Rep. Glenn English, "Electronic Filing of Documents With the Government: New Technology Presents New Problems," Congressional Record-House, Mar. 14, 1984, H1614-1615; U.S. Congress, House, Subcommittee on Government Information, Justice, and Agriculture, Electronic Collection and Dissemination of Information by Federal Agencies, Hearings, April 29, June 26, and October 18, 99th Congress, 1st Sess. (Washington, D.C.: U.S. Government Printing Office, 1986); U.S. Congress, House, H.R. 2600, "Securities and Exchange Commission Authorization Act of 1987," 100th Congress, 1st Sess., June 4, 1987; and U.S. Congress, House, Committee on Energy and Commerce, Securities and Exchange Commission Authorization Act, Report to accompany H.R. 2600, 100th Congress, 1st sess., Rep. No. 100-296 (Washington, D.C.: U.S. Government Printing Office, Sept. 9, 1987). For recent discussion, see J.J. Berman, The Right to Know: Public Access to Electronic Information, Report prepared for the Markle Foundation, in P.R. Newberg, ed., New Directions in Telecommunications Policy, Vol. 2, Information Policy and Economic Policy (Durham, N.C.: Duke University Press, 1989), pp. 39-69; G. Bass and D. Plocher, Strengthening Federal Information Policy: Opportunities and Realities at OMB, Benton Foundation Project on Communications and Information Policy Option (Washington, D.C.: The Benton Foundation, 1989); statements of Nancy Kranich, Director of Public and Administrative Services, New York University Libraries, on behalf of the American Library Association, and D. Kaye Gapen, Dean of Libraries, University of Wisconsin, on

Policy on the free flow of STI. The Federal role in the U.S. scientific and technical enterprise is premised on the free flow of Federal STI. Until recently, this basic premise of openness has been

behalf of the Association of Research Libraries, before a May 23, 1989, hearing of the House Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture; statement of Alan F. Westin, President, Reference Point Foundation, and Professor of Public Law and Government, Columbia University, before an April 18, 1989, hearing of the House Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture; H.H. Perritt, Jr., Electronic Acquisition and Release of Federal Agency Information, Report to the Administrative Conference of the United States, October 1, 1988; Administrative Conference of the United States, Recommendation 88-10 on "Federal Agency Use of Computers in Acquiring and Releasing Information," adopted December 8-9, 1988; and statement of K.B. Allen, Senior Vice President for Government Relations, Information Industry Association, before an April 18, 1989, hearing of the House Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture.

modified only in narrowly defined areas of STI relating primarily to national security. However, over the last decade or two, several trends have converged to greatly complicate questions of free versus restricted flow of Federal STI.

First, the U.S. no longer has a commanding lead in many areas of science and technology. The across-the-board U.S. advantage that existed in the immediate post-World War II years, perhaps through the 1950s and 1960s, no longer exists. Second, the global economy is now much more competitive, with foreign countries and companies offering a strong challenge to traditional U.S. dominance in numerous industries and economic sectors. For example, the percentage of foreign-owned U.S. companies, foreign students in U.S. graduate programs, and foreign ownership of U.S. patents has increased dramatically since the 1960s. Third, the U.S. military advantage, while still significant, is under pressure in part as a result of intensified technical and economic competition from foreign powers. Fourth, electronic technologies vastly speed up the collection, storage, and dissemination of STI and thus accelerate the rate of information transfer within the scientific and technical community on a national and global scale.

It is not surprising, then, that the 1980s have seen numerous efforts to further restrict access to Federal STI for economic or security reasons. As examined in several prior OTA reports, the primary grounds for access restrictions are national security, foreign policy, and international competitiveness.¹² National security restrictions have the

longest history. DOD generally recognizes the need for open exchange of basic research information to the maximum extent possible, in order to promote the scientific progress on which the defense technology base ultimately depends. However, various DOD components (e.g., especially the Air Force and National Security Agency (NSA)) favor a restrictive approach on access to applied research and technical information. This restrictive approach culminated in proposals to give NSA the lead governmentwide role in computer security and to extend the NSA role to so-called "sensitive but unclassified" Federal information.¹³ This category was to include information that, while unclassified by itself, becomes sensitive to the national security when, for example, aggregated in electronic form and available over online databases. Strong opposition to these proposals by the commercial information industry, academia, scientific and library associations, civil liberties groups, and Congress contributed to enactment of the Computer Security Act of 1987. This act assigned the National Bureau of Standards (now the National Institute of Standards and Technology (NIST)) - rather than NSA -- the lead role for civilian computer security, and limited the role of DOD with regard to unclassified, civilian Federal information. Information industry and civil liberties representatives, among others, remain concerned about the NSA role in civilian information systems, and the need to ensure the free flow of unclassified Federal information.¹⁴

¹²U.S., Office of Technology Assessment, Federal Government Information Technology: Management, Security, and Congressional Oversight, OTA-CIT-297 (Washington, D.C.: U.S. Government Printing Office, February 1986); The Regulator v Environment of Science, OTA-TM-SET-34 (Washington, D.C.: U.S. Government Printing Office, February 1986); International Competition in Services, OTA-ITE-328 (Washington, D.C.: U.S. Government Printing Office, July 1987); Defending Secrets, Sharing Data, OTA-CIT-310 (Washington, D.C.: U.S. Government Printing Office, October 1987); Science, Technology and the First Amendment, OTA-CIT-369 (Washington, D.C.: U.S. Government Printing Office, January 1988); and Holding the Edge: Maintaining the Defense Technology Base, OTA-ISC-420 (Washington, D.C.: U.S. Government Printing Office, April 1989).

¹³U.S., OTA, Defending Secrets, op. cit., chaps. 1, 6, 7; also see U. R. B. 1 ados', "Controlling Unclassified Scientific and Technical Information," Information Management Review, Vol. 2, No. 4, 1987, pp. 49-60.

¹⁴P.L. 100-235, the "Computer Security Act of 1987," January 8, 1988. Also see testimony of Kenneth Allen, Senior Vice President, Information Industry Association, and Marc Rotenberg, Director, Washington Office, Computer Professionals for Social Responsibility, before a May 4, 1989, hearing of the House Committee on Government Operations, Subcommittee on Legislation and National Security.

Policy debates over limits on STI availability involve the balancing of competing interests.¹⁵ In the realm of international science and technology, Congress is requiring a balanced approach designed to ensure that U.S. "access to research and development opportunities and facilities, and the flow of scientific and technological information, are, to the maximum extent practicable, equitable and reciprocal."¹⁶ In negotiating and overseeing international scientific agreements and activities, the Secretary of State is directed to consider:¹⁷

- scientific merit;
- equity of access by U.S. public and private entities to public (and publicly supported private) research and development opportunities and facilities in each country which is a major trading partner of the U.S.;
- possible commercial or trade linkages with the U.S. which may flow from the agreement or activity;
- national security concerns; and
- any other factors deemed appropriate.

Likewise, concern over international competitiveness has led to various actions to encourage the transfer of technology and related technical data resulting from government conducted or funded R&D to the private sector. The "Stevenson-Wydler Technology Innovation Act of 1980"¹⁸ and the "Federal Technology Transfer Act of 1986"¹⁹

¹⁵ See, for example, H.C. Relyea, Striking A Balance: National Security and Scientific Freedom (Washington, D.C.: American Association for the Advancement of Science, 1985); U.S., OTA, First Amendment, op. cit., ch. 4; and National Academy of Science, Panel on the Impact of National Security Controls on International Technology Transfer, Balancing the National Interest: U.S. National Security Export Controls and Global Economic Competition (Washington, D.C.: National Academy Press, 1987).

¹⁶ P. L. 100-418, the "Omnibus Trade and Competitiveness Act of 1988," August 23, 1988, Part I I -- Symmetrical Access to Technological Research, Sec. 5171 (a).

¹⁷ *Ibid.*, Sec. 5171 (d).

¹⁸ P. L. 96-480, Oct. 21, 1980.

together established a variety of mechanisms to facilitate transfer of technology from Federal laboratories to the private sector. These acts authorized Federal laboratories to enter into cooperative R&D agreements with other governmental (Federal, State, local) entities and with the private sector (including universities and commercial firms), and to license, transfer, or waive patent rights resulting from such R&D. A major dilemma for dissemination of Federal STI comes with proposals to extend technology transfer policies from the technology itself to the technical data about the technology. The transfer of rights in technical data from government to the private sector could restrict access to a significant portion of unclassified Federal STI.

A 1987 executive order directs agencies to develop policies that, in effect, transfer technical data by enabling Federal contractors and grantees to retain rights in computer software, engineering drawings, and other technical data generated under Federal contract or grant.²⁰ This executive order and related proposals by the Office of Federal Procurement Policy²¹ have led to a vigorous debate about how to balance the desire for domestic technology transfer with other important governmental objectives. Agencies such as DOE and NASA recognize the open exchange of technical information as a fundamental component of their research missions. A blanket transfer of rights in technical data could seriously impair the conduct of research in fields such as energy and space that generate the very technologies which some desire to be transferred. In other words, too much emphasis on short-term commercialization of technology and related technical data could actually impair the U.S. long-term competitive posture.²²

¹⁹ P. L. 99-502, Oct. 20, 1986.

²⁰ E.O. 12591, April 10, 1987.

²¹ U.S. Office of Federal Procurement Policy, "Intellectual Property Rights Policy," draft, February 1989.

²² See, for example, the special issue, "Symposium on the Impact of Competitiveness," Government Information Quarterly, Vol. 6, No. 1, 1989.

A further complicating factor is that, in many fields of science and technology, STI developed by other countries is increasingly important. Policies that severely restrict public access to unclassified Federal STI could lead to reciprocal policies in other countries, with the net result that the international exchange of STI would decline. For example, in the area of energy research, the thrust of DOE policy is to increase—not decrease—the exchange of international energy STI. The DOE Office of Scientific and Technical Information manages a two and one-half year old Energy Technology Data Exchange (ETDE) under the auspices of the international Energy Agency and with the participation of Canada, Denmark, Finland, Federal Republic of Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, and United Kingdom in addition to the United States.²³

The participating countries transmit summaries of energy-related STI to DOE on a monthly or biweekly basis, where the summaries are consolidated and provided (on magnetic tape) to participating countries for dissemination to researchers and policymakers. The ETDE includes about 7,500 biweekly updated STI entries and over 2 million entries in the retrospective file. The latter is available via online commercial vendors to research organizations, universities, and libraries within the participating countries. Online usage is divided roughly as follows: industry (71 percent); academia (15 percent); and government (14 percent).²⁴

The role of commercial online vendors in the ETDB highlights another implication of overly restrictive policies on STI dissemination. Numerous vendors sell or resell Federal STI databases, or larger databases that include significant

Federal STI, to both domestic and international customers. One selling point is the completeness of a particular database, or ensemble of databases, with respect to STI in any particular subject area. A significant erosion in availability of Federal STI to commercial vendors (and for that matter, not-for-profit vendors as well), coupled with possible reciprocal restrictions by other countries, would likely impair the viability and certainly the utility of these databases.

A major challenge, then, is to develop an STI dissemination policy that:

1. encourages U.S. researchers to employ electronic means, where appropriate, to facilitate access to and use of domestic and foreign STI; but at the same time
2. protects U.S. national security interests by controlling access to classified or narrowly defined militarily-sensitive STI; and
3. encourages U.S. international competitiveness through
 - a. the open, reciprocal international exchange of STI,
 - b. domestic transfer of Federally-funded technology from the Federal government to the private sector where appropriate,
 - c. protection of private sector proprietary rights in technology and data (to the extent non-Federal funds are used), and
 - d. domestic transfer of rights in technical data developed by or for the Federal Government (with Federal funding) to the private sector in narrowly defined areas where the benefits substantially outweigh the costs."

Congress needs to reconcile differing philosophies about the free flow of STI in developing guidance for the Federal science agencies. This

²³International Energy Agency, Energy Technology Data Exchange, 1988 Annual Report, ETDE/OA-10 (Oak Ridge, TN: U.S. Department of Energy, Office of Scientific and Technical Information, 1988); International Energy Agency, Introducing ETDE: An IEA Multilateral Information Program, ETDE/OA-06 (Oak Ridge, TN: U.S. Department of Energy, Office of Scientific and Technical Information, June 1988).

²⁴Ibid.

²⁵For some proposed policy statements, see "Changing Federal Relationships in Intellectual Property," February 1989 draft, provided to OTA by CENDI, and "Policy Directions [in New Regulations on Patents and Copyrights]," May 1989 draft, provided to OTA by NASA.

balancing should take into account proposed legislation that emphasizes the open, unrestricted flow of Federal information as well as legislation that focuses on the transfer of Federally-supported technology and information to the private sector.²⁷ This balancing also needs to consider existing statutes that promote information access (such as the Freedom of Information Act²⁸) and those

statutes that limit access in some ways. For example, the Defense Authorization Act of 1984 granted DOD authority to withhold from public disclosure certain unclassified but militarily-sensitive and export-controlled scientific and technical information developed by or for DOD that would otherwise be accessible under FOIA.²⁹

²⁶U. S. Congress, House, H. R. 2381, the "Information Policy Act of 1988," 101st Congress, 1st Session, May 16, 1989; also see U. S. Congress, House, H. R. 2773, the "Freedom of Information Public Improvements Act of 1989," 101st Congress, 1st Session, June 28, 1989, that would redefine government records for FOIA purposes to cover all "computerized, digitized and electronic information." Also, draft bills to reauthorize the Paperwork Reduction Act and amend the printing chapters of 44 USC emphasize the free flow of Federal information.

²⁷See U. S. Congress, Senate, S. 550, the "Department of Energy National Laboratory Cooperative Research and Technology Competitiveness Act of 1989," 101st Congress, 1st Session, March 9, 1989, as amended August 4, 1989, and included as Part C of S. 1352, the "National Defense Authorization Act for Fiscal Years 1990 and 1991," August 4, 1989. Also see U. S. Congress, Senate, Committee on Armed Services, National Defense Authorization Act for Fiscal Years 1990 and 1991, Report No. 101-81, 101st Congress, 1st Session (Washington, D.C.: U. S. Government Printing Office, July 19, 1989); and U. S. Congress, Senate, Committee on Energy and Natural Resources, Department of Energy National Laboratory Cooperative Research and Technology Competitiveness Act of 1989, Report No. 101-108, 101st Congress, 1st Session (Washington, D.C.: U. S. Government Printing Office, August 4, 1989).

²⁸For a detailed discussion of issues concerning an electronic FOIA, see J. Grodsky, "The Freedom of Information Act in an Electronic Age," in U. S. OTA, Informing the Nation, op.cit., pp. 207-236; also see J. J. Berman, The Right to Know: Public Access to Electronic Information, op.cit.; H. H. Perritt, Jr., Electronic Acquisition and Release of Federal Agency Information, op.cit.; and Thomas L. Susman, Chairman, American Bar Association, Committee on Government Information and Privacy, "Access to Electronic Information Under the Freedom of Information Act," draft report, February 28, 1989. Also see statements of Ronald Plessner, Esq., Piper & Marbury, and Patti A. Goldman, Esq., Public Citizen, Inc., before a July 11, 1989, hearing of the House Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture.

Technical standards and directories for STI dissemination. Appropriate technical standards are essential if the government wishes to realize cost-effectiveness and productivity improvements and to facilitate private sector use of Federal STI. Technical standards can accommodate flexibility among different formats so that once the information is input to the system, it can be processed, edited, revised, stored, and disseminated in electronic, paper, or microfiche formats. Standards developed for Federal STI should be compatible, to the extent possible, with those adopted by the private sector. Priority areas for standards-setting include:

- STI indexing and cataloging (standard formats are needed, so that NTIS, GPO, and mission agencies are using compatible approaches);
- STI quality control (especially for preventing or minimizing errors in collecting data and creating documents, and for maintaining data and document integrity throughout the information life cycle);
- STI security (technical and administrative standards for preventing unauthorized use or alteration of Federal STI);
- text markup and page/document description languages (e.g., Standard Generalized Markup language, which has been issued as an international standard and as a Federal Information Processing Standard (FIPS));
- optical disks (there has been significant progress on CD-ROM standards, e.g., for mastering, formatting, and reading, but not

²⁹U. S. Congress, P. L. 98-94, "Department of Defense Authorization Act of 1984," September 24, 1983; also see W. Blades, "Controlling Unclassified Information," op.cit.

- yet for search and retrieval software; standards for WORM, Erasable, and CD-1 disks are in earlier stages of development); and
- electronic data interchange, including the open systems interface (OSI) concept (e.g., an OSI procurement standard has been issued as a FIPS).

Most STI managers, users, and private vendors agree to the need for interoperability among the various systems and equipment. The Federal Government can accelerate the development and adoption of the necessary standards. An overall Federal STI strategy could reinforce the role of the National Institute of Standards and Technology in standards setting, working with GPO, NTIS, and the Federal science agencies.

The large STI databases—such as in the geographic, space, and earth sciences—must have technical standards for data archiving and exchange, if these resources are to be managed and used effectively. For example, geographic information systems (GIS) will permit much greater data exchange among the Federal science agencies. GIS require the integration of multiple data sets—frequently originating from several different agencies. Most Federal agencies with GIS applications are using major data sets from one, or typically, several other agencies.³⁰ GIS must have standards to ensure interoperability among users in different agencies. Most agencies using GIS have not yet developed standard definitions and/or classifications for the major thematic data categories used in GIS applications and do not have an operational program to collect and manage standardized data for use in GIS applications.³¹ The formally chartered (by OMB) Federal Interagency Coordinating Committee on Digital Cartography (chaired by USGS) has made progress in developing a standard format for Federal geographic information storage and exchange.³²

³⁰U. S. Interagency Coordinating Committee on Digital Cartography, Reports Working Group, A Summary of GIS Activities in the Federal Government, August 1988, pp. 16-18.

³¹Ibid., pp. 13-15.

With regard to space science data, NASA is active in the standards arena. The Science Data Systems Standards Office (at NASA's National Space Science Data Center (NSSDC)) is responsible for supporting standards development, working with the national and international standards organizations, validating standards, and disseminating information about standards. NASA recognizes the importance of technical standards to space science data collection, storage, and dissemination. The NSSDC has developed a generic data storage standard, known as the Common Data Format that is being beta-tested by NASA laboratories, other government agencies, universities, corporations, and foreign institutions."

In the area of earth science data, the standards-setting effort is being led by the Interagency Working Group on Data Management for Global Change, whose members include NASA, NOAA, NSF, USGS, the U.S. Navy, and the Departments of Energy, Agriculture, and State. The working group has emphasized the importance of technical standards to facilitate the exchange of data directory information and the actual data sets. Standards are needed to assist scientists and others to access and use earth sciences data on a variety of computers and over a range of electronic

³²See, for example, U. S. Federal Interagency Coordinating Committee on Digital Cartography, Standards Working Group, Federal Geographic Exchange Format: A Standard Format or the Exchange of Spatial Data Among Federal Agencies, December 15, 1986, and U. S. Interagency Coordinating Committee, Coordination of Digital Cartographic Activities in the Federal Government, Third Annual Report to the OMB Director, 1988. For discussion of the need for a directory to GIS activities and improved Federal/State/Local cooperation on GIS, see Lisa Warnecke, "Geographic/Land Information Development Coordination Clearinghouse and Network," * Syracuse University, School of Information Studies, January 1989, and "Geographic Information Coordination in the States: Past Efforts, Lessons Learned, and Future Opportunities," in Piecing the Puzzle Together: A Conference on Integrated Data for Decisionmaking, proceedings, National Governors' Association, Center for Policy Research, May 27-29, 1987.

³³U. S. National Aeronautics and Space Administration, Goddard Space Flight Center, National Space Science Data Center, NSSDC Data Listings, NSSDC-88-01, January 1988.

networks. This includes the need for standards on data quality. The working group has enlisted the National Institute of Standards and Technology (NIST) in its standards-setting activities. Likewise, the National Research Council's Numerical Data Advisory Board is emphasizing the role of NIST in developing governmentwide standards for large-scale scientific and technical databases of all types.

Directories to Federal STI are also essential, to help users find the information they seek. Proposed OMB policy and legislation³⁴ would mandate an improved directory or index (or several directories or indices) to Federal information, presumably including STI. There is concern that a directory or index might be used by OMB to thwart rather than facilitate agency information dissemination. OMB has proposed that it not use the directories for review and approval purposes, and, indeed, that agency directories not even be submitted to OMB but to a designated governmentwide agency (OMB suggests NTIS) for consolidation and dissemination.³⁵ A logical approach would be for NTIS and GPO to collaborate on preparation of a governmentwide directory, and start by collecting and consolidating available agency-specific directories.

Directories to large scale scientific databases as well as STI documents should be included in such efforts. For example, the proliferation of space science electronic databases -- offline and online -- reinforces the importance of directories to help users locate the desired information. NASA's Master Directory provides online access to a directory of NASA and other space and earth science data sets and related information systems. For each data set, the directory includes a descriptive title, abstract, references, contact persons, archival information, storage media, and technical details (e.g., parameters measured, scientific dis-

cipline, spatial coverage, time period). The directory also allows connection to other information systems, or database directories, such as those maintained by NOAA or USGS.³⁶ The NASA directory concept may be applicable to other Federal science agencies, and could be made available to the Federal depository libraries and other Federal information dissemination facilities. In addition to the directory, NASA is developing expert systems software to help users rapidly search, access, manipulate, and display data.

The Interagency Working Group on Data Management for Global change is committed to the development and adaptation of NASA's master directory into an "interoperable directory" that will provide access to information about global change data. Earth sciences data will be maintained by each agency on a decentralized basis, along with detailed catalogs or inventories of these agency data sets. Summary descriptions of the data sets will be included in a central directory that can route inquiries to the appropriate detailed catalogs located at individual data centers and can also transfer data among the various data centers and users. Both online and offline electronic services will be available.³⁷

The operational version of the directory will include the following Federal earth sciences data centers or systems: NASA (National Space Science Data Center including the NASA Climate, Ocean, and Land Data Systems); NOAA (National Oceanographic Data Center, National Geophysical Data Center, National Climatic Data Center); and USGS (Earth Science Information Center, Earth Resources Observing Satellite [Eros] Data Center, National Water Data Exchange [NAWDEX], and

34U. S. OMB, "Second Advance Notice of Policy Development," June 15, 1989, op. cit., p. 25555; and U. S. Congress, House, H. R. 2381, op. cit., Sec. 2(i) (3).

35U. S. OMB, "Second Advance Notice," op. cit., p. 25556.

36U. S. National Aeronautics and Space Administration, Goddard Space Flight Center, The National Space Science Data Center, NSSDC-88-26, January 1989, pp. 5-6.

37U. S. National Aeronautics and Space Administration, Goddard Space Flight Center, National Space Science Data Center, "Report on the Third Catalog Interoperability Workshop, November 16-18, 1988," James R. Thiemann, Mary E. James, and Patricia A. Bailey, eds., March 1989.

Earth Science Data Directory, among others).³⁸ In order to further test the directory concept on a smaller scale, the working group and participating Federal agencies are supporting the development of an Arctic environmental data directory.

Arctic climate is thought to be a particularly sensitive indicator of global change, and thus the arctic data directory should have direct utility to the global change research program as well as serving as a prototype for a larger earth sciences data directory. CD-ROM will be considered as a medium for dissemination of both the Arctic data directory and selected data sets.³⁹ CD-ROMs are also planned for reference and bibliographic materials relevant to polar regions (e.g., one CD-ROM for the 83,000 references in libraries with major polar collections).

Role of governmentwide dissemination and archival agencies. Another important aspect of STI dissemination strategy is the role for governmentwide dissemination and archival agencies and their relationship to the Federal science agencies. Defining and balancing these roles is complicated by the transition from paper (and to a lesser extent microfiche) to electronic formats now underway. This is especially true for scientific and technical information, a significant percentage of which is already in digital form and frequently only usable in electronic formats.

The major governmentwide agencies include: the Government Printing Office (GPO) which is responsible for printing and sales of selected documents by the Superintendent of Documents

(SupDocs), and distribution of documents through the Depository Library Program; the National Technical Information Service (NTIS) for the clearinghouse and sales of technical documents; and the National Archives and Records Administration (NARA) with regard to archiving and long-term preservation of documents. All of these agencies play major roles today for STI in paper and microfiche document formats, but less so for STI in electronic formats and databases. The implications of electronic information for these agencies are discussed in OTA's Informing the Nation⁴⁰ (which considered GPO, SupDocs, DLP, and NTIS) and the National Academy of Public Administration's The Effects of Electronic Recordkeeping on the Historical Record of the U.S. Government (which focussed on NARA).⁴¹ Both reports discussed a number of alternatives and emphasized the importance of sound strategic planning for electronic formats.

A key question concerns the degree of centralization versus decentralization for the storage and dissemination of Federal STI. When considering electronic STI, it is clear that the creation, storage, and dissemination of STI is fundamentally and inherently decentralized within the science agencies.

There are several reasons for the decentralized nature of STI. First, the volume of STI is vast, and many agencies have difficulty in managing their own STI, much less another agency's data. The notion of centralizing all STI in one data bank is neither cost-effective nor technically feasible at this time. Second, the technical systems for creating, storing, and disseminating STI are typically closely tied to agency automation programs. Centralizing STI dissemination systems, even if technically feasible, could fore-

³⁸See, for example, U.S. Interagency Working Group on Data Management for Global Change, "Interagency Session on Data Management for Global Change," minutes of meeting dated September 18, 1987.

³⁹See August 8, 1988, memo from Thomas L. Laughlin, Coordinator, Arctic Environmental Data Workshop, NOAA, to Arctic Environmental Data Directory Working Group; Douglas R. Posson, "Arctic Environmental Data System: Results from the Boulder, Colorado Workshop," Arctic Research of the United States, Fall 1988, Vol. 2; and February 3, 1989, memo from Douglas R. Posson, Chairman, Arctic Environmental Data Directory Working Group, USGS, to Working Group Members.

⁴⁰U. S. OTA, Informing the Nation, op. cit., see esp. ch. 4-7, and 12.

⁴¹National Academy of Public Administration, The Effects of Electronic Recordkeeping on the Historical Record of the U.S. Government (Washington, D.C.: National Archives and Records Administration, January 1989). Also see, Committee on the Records of Government, Report (Washington, D. C. : Council on Library Resources, March 1985).

close innovation and opportunities for improving productivity in the agencies. Third, the diversity of STI needs and users among the Federal science agencies spans a wide spectrum of disciplines and research areas. A decentralized approach brings agency STI officials and the scientists and researchers who create and use the STI closer together. Fourth, the economies-of-scale for electronic formats are achieved at lower levels of demand than for ink-on-paper printing. For example, copies of floppy diskettes or CD-ROMs can be produced cost-effectively at volumes of only tens to a few hundreds, while many conventional press runs require volumes in the thousands to capture economies-of-scale.

Several agencies have data centers that are responsible for collection, archiving, and dissemination of databases, and much of these data are already in electronic formats. The major data centers include: the National Space Science Data Center, National Climatic Data Center, National Oceanic Data Center, National Geophysical Data Center, Earth Science Information Center, and Earth Resources Observing Satellite Data Center, among others. On the bibliographic and document side of STI, several of the science agencies have their own central STI office (e.g., at NASA and DOE⁴³), and most have a significant infrastructure for STI, although the actual structure and administration varies widely among the agencies (e.g., in terms of resources, staffing, visibility).

A key challenge is to preserve and possibly strengthen the ability of the governmentwide agencies to carry out their information responsibilities within a decentralized, increasingly electronic environment. A range of alternatives was considered by OTA in *Informing the Nation*,^{*} by various congressional committees in hearings on NTIS, GPO, and the DLP,⁴⁴ and at a recent

NARA conference on electronic recordkeeping.⁴⁵ The NARA conference identified a combination of roles and responsibilities that seems to be balanced and especially well-suited to STI.

Under this scenario, the Federal science agencies retain primary responsibility for the storage and dissemination of STI collected or developed by each agency. The science agencies would operate pursuant to: OMB guidance promulgated under the Paperwork Reduction Act (chapter 35 of Title 44 of the U.S. Code, as possibly further amended to provide congressional statutory guidance on overall dissemination policy); GPO (and Joint Committee on Printing) guidance promulgated under the printing chapters of Title 44, as possibly amended, to ensure that the integrity of the GPO printing procurement program, SupDocs sales program, and DLP is maintained; NTIS guidance promulgated under the "National Technical Information Service Act of

44See, for example, U.S. Congress, House, Committee on Science, Space, and Technology, Subcommittee on Science, Research, and Technology, National Technical Information Service, Hearing, 100th Congress, 2nd Session (Washington, D. C.: U.S. Government Printing Office, Feb. 24, 1988); U.S. Congress, House, Committee on Science, Space, and Technology, National Bureau of Standards Authorization Act for Fiscal Year 1989, Report 100-673, Part 1, 100th Congress, 2nd Session (Washington, D.C.: U.S. Government Printing Office, June 3, 1988); U.S. Congress, House, Committee on Energy and Commerce, National Bureau of Standards Authorization Act for Fiscal Year 1989, Report 100-673, Part 2, 100th Congress, 2nd Session (Washington, D.C.: U.S. Government Printing Office, July 8, 1988); U.S. Congress, House, Committee on Administration, Subcommittee on Procurement and Printing, hearings on "Review of the Printing Chapters of Title 44 of the U.S. Code Due to the Changes in Electronic Information Format, Distribution, and Technology During the Last Decade," May 23-24 and June 28-29, 1989; U.S. Congress, House, Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture, hearings on "Federal Information Dissemination Policies and Practices," April 18, May 23, and July 11, 1989.

43See U.S. National Aeronautics and Space Administration, The NASA Scientific and Technical Information System and How to Use It, NASA SP-7073, Washington, D.C., 1989; and U.S. Department of Energy, The Role of the Office of Scientific and Technical Information in DOE's Scientific and Technical Information Program, November 1988.

45U.S. National Archives and Records Administration, "Electronic Records: A Strategic Plan for the 1990s," Conference Summary and Recommendations, June 21-23, 1989, see especially the recommendations of the working group on information collection and dissemination.

44U.S. OTA, Informing the Nation, op. cit.

1988⁴⁶ to insure that the integrity of the NTIS clearinghouse is maintained; and NARA guidance promulgated under the archival chapters of Title 44, as possibly amended, to insure long-term preservation and access to STI. This is predicated on the assumption that OMB, GPO, NTIS, and NARA guidance would be consistent and compatible.

A possible division of responsibilities between the mission agencies and governmentwide agencies is highlighted below with respect to an illustrative hypothetical electronic product-USGS hydrology information (e.g., trends in stream flows and reservoir and lake levels) issued on CD-ROM:

- USGS would notify GPO, NTIS, and NARA in advance of production and supply product information (e. g., size of the hydrology database, type of search and retrieval software, estimated cost and demand).
- GPO would decide whether the CD-ROM should be included in the SupDocs sales program, based on an estimate of demand beyond that being met by USGS direct sales. USGS could opt to use SupDocs as the primary sales outlet if the CD-ROM qualified.
- GPO also would determine whether the CD-ROM should be offered to depository libraries, and if so, how many libraries desired a copy of the CD-ROM.
- NTIS would decide whether the CD-ROM should be included in the NTIS clearinghouse and sales program.
- GPO and NTIS would, on a coordinated basis, make sure that the CD-ROM is cataloged and listed in appropriate governmentwide directories and bibliographic databases.
- NARA would review the CD-ROM to determine long-term archival needs.
- GPO and NTIS would, again on a coordinated basis, advise USGS of their need for copies of the CD-ROM (to meet estimated SupDocs sales, depository

library distribution, and NTIS sales needs).

- USGS would obtain CD-ROM production services in the manner that best meets its cost, quality, and turnaround requirements. This could be through an agency contractor, GPO contractor, GPO itself (if an inhouse service is offered), or NTIS contractor (if NTIS offers CD-ROM services).
- Wherever the USGS CD-ROM is produced, GPO and NTIS would ride the order for the number of additional copies required.

The division of responsibilities outlined should be generally applicable to all offline electronic products, including optical disks, magnetic tapes and cassettes, and diskettes (hard and floppy). For online electronic STI databases, the large scale databases would be maintained by the agency data centers. But online directories and possibly small subsets of data might be handled in the same way as the CD-ROM illustration above. Some directories also could be disseminated on CD-ROM or other offline electronic formats.

The roles of NARA and the DLP need special attention. For example, NARA might find that agency data centers can meet archival needs for many STI databases, in which case NARA need not retain physical archival control. However, even when an agency or data center serves as the archive, NARA would help ensure that the archival arrangement is cost-effective and meets data management and technology standards (e. g., regarding longevity of storage media, conversion from one storage medium to another, and portability among different media and equipment). Also, NARA would ensure that when an agency data center determines that certain STI could no longer be retained inhouse, STI scheduled for permanent archival would be transferred to a NARA archive. Machine-readable materials are included within the legal definition of "record."⁴⁷ And NARA has an active program for archiving electronic records, which is now being extended to Federal STI. Potentially permanent electronic records identified by NARA include, for example:⁴⁸

46 See u.s. Congress, P.L. 100-519, Subtitle B -- National Technical Information Service, codified at 15 USC 3701 et. seq.

- unique and important scientific and technical data resulting from observations of natural events or phenomena or from controlled laboratory or field experiments;
- natural resources data related to land, water, minerals, or wildlife; and
- geographic data used to map the surface of the earth.

To accomplish this mission, NARA will need to appraise the vast store of geographic, space, and earth sciences data with respect to archival needs and requirements, a task that becomes even more challenging with the rapid evolution of electronic storage and retrieval technologies.

As for the Depository Library Program, there appears to be a consensus that electronic formats should be included, although there are differences of opinion over implementation.⁴⁹ The continuing

48u. S. National Archives and Records Administration, Managing Electronic Records: An Instructional Guide, draft, no date, pp. 15-17; also see Michael L. Miller, "Appraisal and Disposition of Electronic Records," U.S. National Archives and Records Administration, March 1988 draft; and June 13, 1989, cooperative agreement between NARA and NOAA.

49For the range of viewpoints on the DLP, see: statement of Joseph E. Jennifer, Acting Public Printer, Government Printing Office, before a May 23 hearing of the Committee on House Administration, Subcommittee on Procurement and Printing; Memorandum from GPO General Counsel to Acting Public Printer, "GPO Dissemination of Federal Agency Publications in Electronic Format," May 22, 1989; U.S. Congress, Joint Committee on Printing, resolutions dated April 18, 1987, June 17, 1987, and June 29, 1988, regarding GPO, depository libraries, and electronic formats; Honorable Frank Annunzio, Chairman, Joint Committee on Printing, letter to Honorable Ralph E. Kennickell, Jr., Public Printer, March 25, 1988; U.S. Congress, Committee on Appropriations, Legislative Appropriations Bill, 1989, Report to accompany H.R. 4487, Report No. 100-621, 100th Congress, 2nd Session (Washington, D.C.: U.S. Government Printing Office, 1988); statement of Honorable Viz Fazio, Chairman, House Committee on Appropriations, Subcommittee on the Legislative Branch, before a June 28, 1989, hearing of the House Committee on Administration, Subcommittee on Printing and Procurement; statements of D. Kaye Gapen, Dean of Libraries, University of Wisconsin (on behalf of the Association of Research Libraries), Sandra McAnich, Head, Government Documents, University of Kentucky Libraries (on behalf of the Government Documents Roundtable, American

Library Association), and Kenneth B. Allen, Senior Vice President, Government Relations, Information Industry Association, accompanied by Peyton R. Neal, Jr., Chair, 11A Government Printing Office Committee, before a May 24, 1989, hearing of the House Committee on Administration, Subcommittee on Procurement and Printing. Also see a somewhat more critical statement of Paul P. Massa, President, Congressional Information Services, Inc., before a July 13, 1989, hearing of the National Commission on Libraries and Information Science. One private vendor, Legi-Slate, Inc., has offered to provide electronic online dissemination of selected congressional information to depository libraries at bulk rate discounted prices, based in part on the results of a successful 5 1/2 month pilot test with 51 depository libraries. The same concept could be used by other vendors with respect to other types of Federal information, including STI. See Legi-Slate, "Pilot Project Evaluation Preliminary Summary," January 8, 1989.

50The GAO is conducting an evaluation of the research methodology of the electronic pilot projects. See Donald E. Fossedal, Assistant Public Printer, U.S. Government Printing Office, letter to Richard Fogel, Assistant Comptroller General, U.S. General Accounting Office, May 8, 1989. For background on the pilot projects, see U.S. Congress, Joint Committee on Printing, Provision of Federal Government Publications in Electronic Format to Depository Libraries, Report of the Ad Hoc Committee on Depository Library Access to Federal Automated Databases (Washington, D.C.: U.S. Government Printing Office, 1984); U.S. Congress, Joint Committee on Printing, An Open Forum on the Provision of Electronic Federal Information to Depository Libraries, 99th Congress, 1st Sess. (Washington, D.C.: U.S. Government Printing Office, 1985); and U.S. Congress, OTA, Informing the Nation, op.cit., ch. 6.

**Nation⁵¹ and Technology and U.S. Government
Information Policies: Catalysts for New Partner-
ships.⁵²**

51U. S. OTA, Informing the Nation, op. cit., ch. 7.

52Association of Research Libraries, Technology
and U.S. Government Information Policies: Catalysts
for New Partnerships, ARL, Washington, D. C.,
October 1987. Also see statements of Vicki W.
Phillips, Chair, Depository Library Council to the
Public Printer, Patricia Glass Schuman, President,
Neal-Schuman Publishers, Inc. (on behalf of the
American Library Association), and Bruce M.
Kennedy, Head, Reference Department, Georgetown
University Law Center (on behalf of the American
Association of Law Libraries) before a July 13,
1989, hearing of the National Commission on
Libraries and Information Science.